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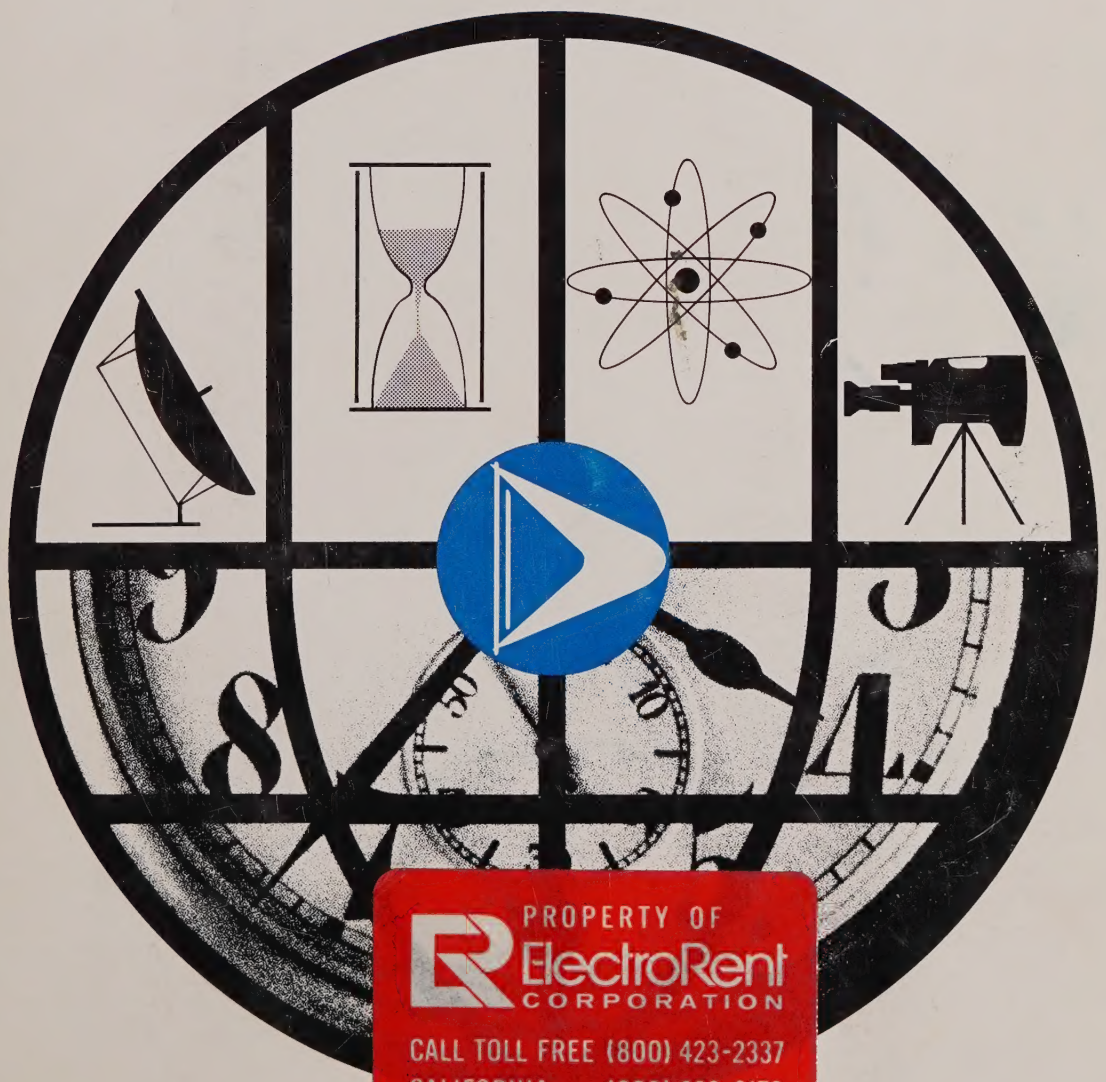
Timing Instrumentation



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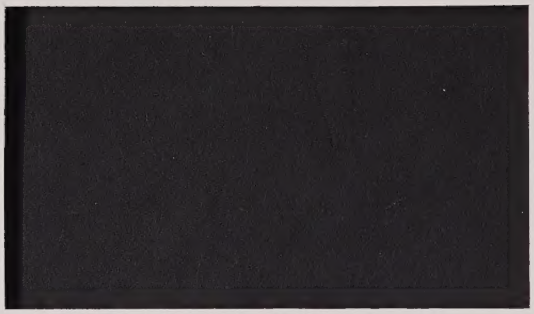

INSTRUCTION MANUAL

MODEL 9300A

TIME CODE

GENERATOR/TRANSLATOR

PART NUMBER 9300-7053

S/N 4141 AND SUBSEQUENT

ADDENDUM

In addition to the basic 9300 Time Code Generator/Translator, the 9300-7053 contains the following options.

1. VIDEO TIME INSERTION (Assembly Number 17269-12)
   a. This option provides for inserting time data (milliseconds, seconds, minutes, hours, days) into a standard Television signal or composite video signal from a video camera or recorder.
   b. This assembly works with both "single field" or "interlaced" system (switch selectable on 17269 assembly).
   c. Specifications

INPUT	
Connector:	J5 (BNC)
Format:	Composite video from video camera or recorder
Amplitude:	1 volt RMS into 75 ohms
OUTPUT	
Connector:	J7 (BNC)
Format:	Composite video (as input) plus inserted time word data
Amplitude:	1 volt RMS into 75 ohms

   d. See following pages for option description and adjustments.

2. PARALLEL OUTPUTS (Assembly Number 16635-12)
   a. 32 bits of BCD time, seconds thru days.
   b. 2 output signal lines, FRP and SAMPLE TIME.
   c. 3 input control lines, FWD*, GO, and $\overline{\text{SEARCH}}$; used with a Tape Search System.

VIDEO TIME INSERTER (60) - (66)
Assembly 17269

FUNCTIONAL DESCRIPTION

This assembly accepts as its input the output of a video camera. This input is operated upon to insert a time word of from 6 to 12 characters in length, customer selectable. This allows for time correlation of customer's video equipment with other system elements such as tape transports, computers and strip chart recorders.

Vernier adjustments are provided for both vertical and horizontal placement of the time word as desired by the customer. Three customer selectable character heights of 16, 32, or 64 lines are provided. Additional controls are provided to delete the time word from the video output, adjust horizontal size, to add or delete a mask around the time word and for field reversal (i.e., black characters against a white mask or white characters against a black mask).

CONTROLS AND ADJUSTMENTS

(Refer to Fig. A for control locations).

SYNC POL S1

This jumper allows the Video Time Inserter to operate with either positive or negative sync pulses.

SYNC SEPARATOR, R6

Sync an oscilloscope internal (+) on A4, pin 12. Adjust R6 for a stable, positive-going 60PPS pulse at A4, pin 12. Use delayed sweep to observe the next of the 60PPS pulses. Further adjust R6 for minimum jitter (20μSec or less) on the second 60PPS pulse. If the oscilloscope being used does not have the delayed sweep feature, adjust R6 for the most stable apparent 60PPS pulse with minimum pulse-to-pulse jitter, no drop-outs and no extra pulses.

HOR. POS R20

Adjusts the horizontal position of the character.

CHAR. WIDTH R22

Adjusts the horizontal width of the character.

SYNC DELAY, R24

Adjust for a stable, positive-going 60PPS pulse at U2, pin 5.

SYNC INT - S/F S2 - 1,2

For standard, two-field interlaced video systems, open switch S2-2 and close S2-1. For single field, non-interlaced video systems open S2-1 and close S2-2.

VERT. POS R26

Adjusts the vertical position of the character.

CHARACTER BYPASS S2-4

In the OFF position, provides insertion of the time word into the video output. In the ON position, the character generator is disabled.

MASK BYPASS Switch S2-5

In the OFF position, inserts a mask around the time word. In the ON position, removes the mask from around the time word.

VERT SIZE S3-6,7,8

For small (16-line) characters, close switch S3-6. For medium (32-line) characters, open switch S3-6 and close S3-8. For large (64-line) characters, open S3-8 and close S3-7. NOTE: Only one character height switch should be closed (ON) at any one time, otherwise operation of the Video Time Inserter will be impaired.

ENABLE DAYS S3-5

In the ON position, adds days to the time word.

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BYPASS SEC S3 - 1,2,3,4

For insertion of three digits of milliseconds into the time word, close switch S3-4. To delete the least significant digit (.001), open S3-4 and close S3-3. To delete the two least significant digits (.001, .01), open S3-3 and close S3-2. To delete the entire milliseconds word, open S3-2 and close S3-1. NOTE: One of these four switches must be closed (ON) for proper operation of the video inserter. If more than one of these switches are closed, proper operation may be impaired.

MILLISECONDS STORAGE S2 -6,7 (Optional)

Whenever the milliseconds storage option is to be used in conjunction with a standard-broadcast type, two-field interlaced video system close S2-7. When being used with a single-field video system, open S2-7 and close S2-6. NOTE: If both S2-6 and S2-7 are closed, operation of the milliseconds storage option may be impaired.

CHARACTER POLARITY S2-3

Function is determined by setting of SYNC POL switch, S1. The closed (ON) position provides black characters with S1 in the NEG position and provides white characters with S1 in the POS position. In the open (OFF) position, these functions are reversed.

CHAR. LEVEL 1, R41

Used in conjunction with the off position of CHARACTER POLARITY switch S2-3 to adjust character intensity.

CHAR. LEVEL 2, R53

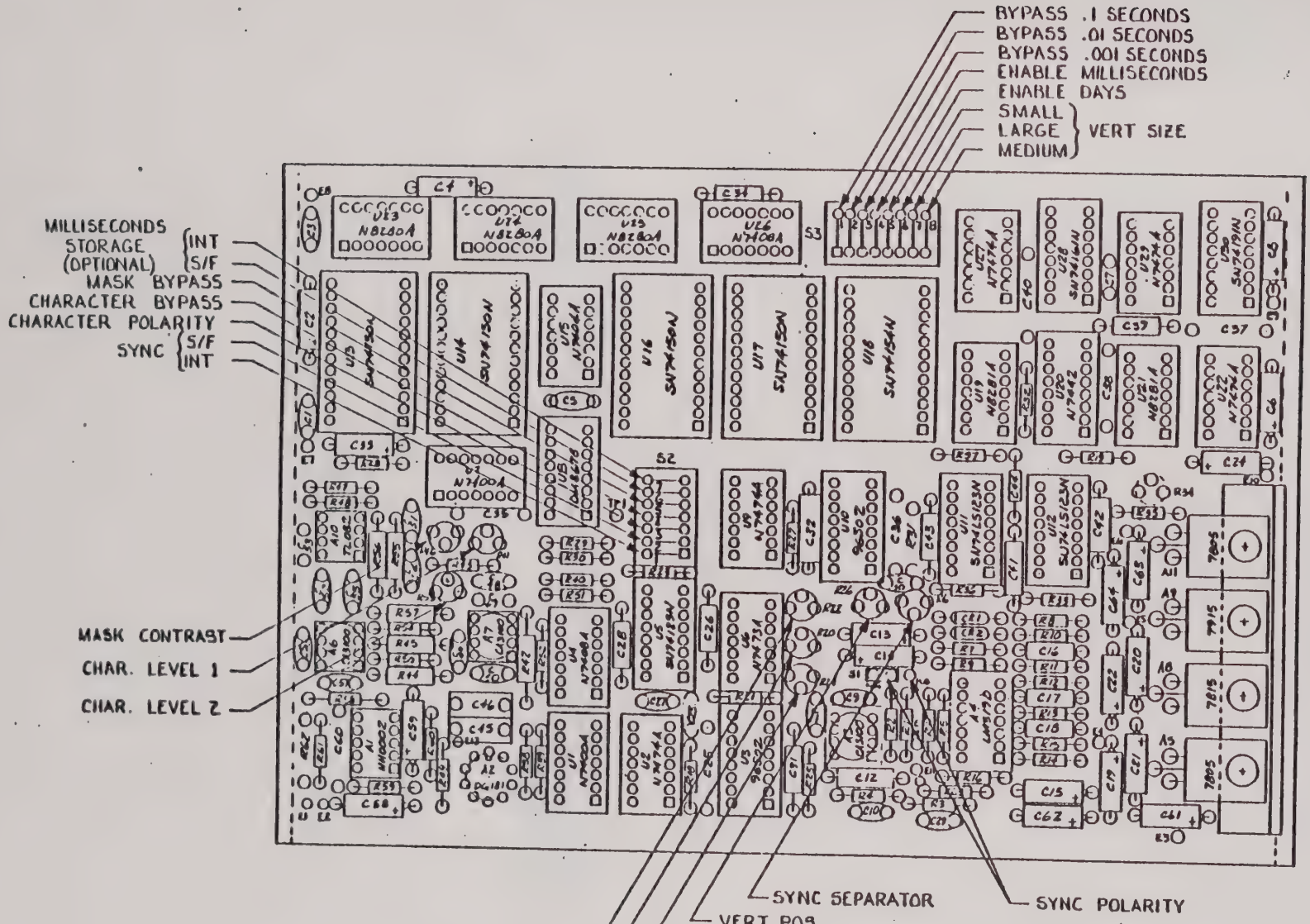
Used in conjunction with the ON position of CHARACTER POLARITY switch S2-3 to adjust character intensity.

MASK CONTRAST R46

Adjusts the shade of the mask from black through white.

Input Impedance - 75 ohms

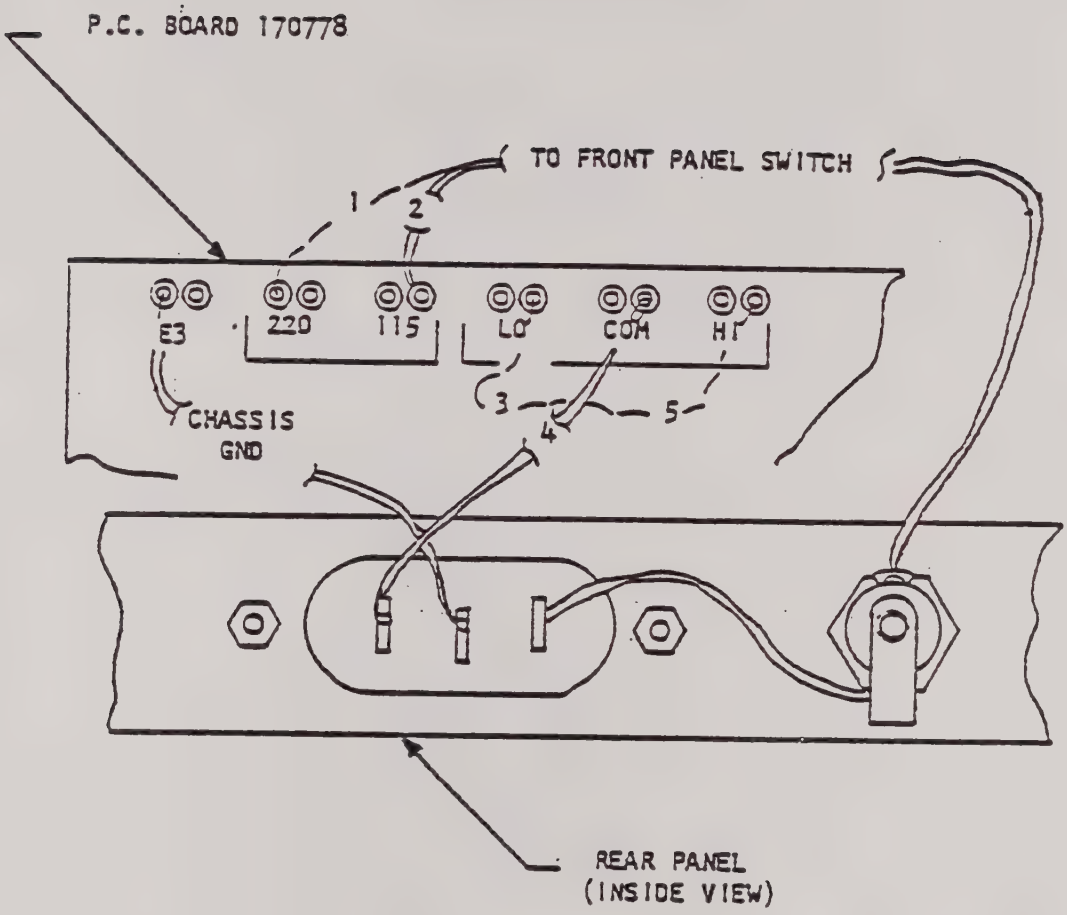
Output Impedance - less than 75 ohms.



'Video Time Inserter.
Controls and Adjustments
Figure A

NOTE:

1. The Model 9300 is shipped for use with 115V AC operation unless identified for 220/230 VAC at AC power connector. See next page for changes to 220 VAC operation.



1. Jumper #1 For 220 VAC Operation
2. Jumper #2 For 115 VAC Operation
3. Jumper #3 For Lo Line Voltage
4. Jumper #4 For Normal Line Voltage
5. Jumper #5 For Hi Line Voltage

TABLE OF CONTENTS

I	SYSTEM DESCRIPTION	I-1
	1.1 General	I-1
	1.2 Time Code Generator	I-1
	1.3 Time Code Translator	I-1
	1.4 Physical	I-2
II	SPECIFICATIONS	
	2.1 Inputs	II-1
	2.2 Outputs	II-1
	2.3 Time Base	II-2
	2.4 Environment	II-3
	2.5 Physical	II-3
III	OPERATING PROCEDURES	
	3.1 Generator Mode	III-1
	3.2 Translate Mode	III-1
	3.3 Bypass Operation	III-2
	3.4 Direction Control	III-2
	3.5 Input Code Polarity Control	III-2
	3.6 Internal Filter Control	III-2
	3.7 Tape Search Operation (Optional)	III-3
	3.8 5 Rate Slow Code (Optional)	III-3
	3.9 Input Code Select (Optional)	III-3
	3.10 Advance/Retard (Optional)	III-3
	3.11 External Start (Optional)	III-4
	3.12 Detailed Bypass Operation	III-5
IV	ADJUSTMENTS	IV-1

TABLE OF CONTENTS (Continued)

V	THEORY OF OPERATION	V-1
	5.1 Logic Description and Used	V-1
	5.2 General	V-2
	5.3 Detailed Logic Description	V-4
VI	MAINTENANCE	VI-1
VII	LIST OF DRAWINGS	VII-1
VIII.	LIST OF MATERIALS	VIII-1

SECTION I

SYSTEM DESCRIPTION

1.1 The Model 9300 Time Code Generator/Translator is designed to perform two basic functions. First, the unit generates a time code in suitable form for recording on magnetic tapes or paper charts. Secondly, the unit is capable of reading the recorded time when played back from a magnetic tape or other sources. The standard format includes BCD seconds, minutes, hours and days only in both the generator and translator modes.

1.2 TIME CODE GENERATOR

As a Time Code Generator the Model 9300 develops a serial, coded time code, modulated to allow recording on magnetic tape or to allow convenient distributic to remote users. The IRIG Format B is used so that the unit is compatible with many other existing facilities or other standard instrumentation equipment. The standard format is modified to include BCD seconds, minutes, hours and days only. Front panel controls allow the clock to be stopped, started or preset. Each digit of seconds, minutes, hours and days is settable to allow time-of-day or elapsed time operation. The basic clock accumulates time on a 24-hour basis and is accurately updated each second.

1.3 TIME CODE TRANSLATOR

When placed in the translate mode the unit will accept the standard IRIG B format either as generated in the Time Code Generator mode or as received from other sources. By using the standard IRIG Format B, the translator is usable in conjunction with other systems or projects. The unit automatically decodes the serial input code and provides a front panel display, serial pulse trains and optional digital outputs. Reading accuracy is better than 50 microseconds when reading in the forward playback mode.

A synchronization mode, selectable from the front panel, provides noise rejection. This feature allows the selection of "zero," "one," "two," "four," "eight," or "infinite" time frames bypass if input errors are detected. This feature is most important when digital outputs are required,

or tape search operation is desired. With "zero" selected each time frame is read. With one, two, four or eight selected, the unit is resynchronized only after the selected number of consecutive errored frames. With "infinite" selected, the unit updates from the carrier only and disregards the coded information. The unit must be synchronized in one of the other bypass positions prior to selecting the "infinite" mode.

1.4 PHYSICAL

The Model 9300 is constructed in a 1-3/4" package, requiring minimum 19" rack mounting or offering easy handling for desk mounting. A decimal display located on the front panel, shows either generated time or translated time depending on mode of operation. All operating mode controls are mounted on the front panel. Each display digit is individually presettable with a single thumbwheel switch and a pushbutton for each digit.

The circuitry of the Model 9300 consists of TTL and DTL type integrated circuits. Each element is mounted in a modular socket for ease in maintainability.

SECTION II

SPECIFICATIONS

2.1 INPUTS

2.1.1 J6 Power

a. 115/230 VAC ±10%

b. 48 to 420 Hz

2.1.2 J1 Code Input

a. Format:	IRIG B BCD Time of Year (B122). (Control functions and straight binary seconds may be included in the code but are not recognized as valid data in the standard instrument.)
b. Modulation Frequency:	1 kHz
c. Modulation Ratio:	2:1 - 6:1
d. Amplitude:	100 MV p-p to 10V p-p on the mark pulse.
e. Input Z:	100 K ohm minimum
f. Frequency Range:	10 Hz - 300 kHz
g. Synchronization Accuracy:	Less than ±50 microseconds

2.2 OUTPUTS

2.2.1 J2 IRIG B: BCD Time of Year (B122)

(NOTE: This output is only available when operating in the GEN mode.)

a. Carrier Frequency:	1 kHz sinewave
b. Amplitude:	Adjustable from 0 to 10V p-p on the mark pulse.
c. Modulation Ratio:	Adjustable from 2:1 through 4:1
d. External Load:	$\geq$ 600 ohms

2.2.2 J3 Standard Pulse Rates

a. Rates:

1K pps	Pin 1
100 pps	Pin 2
10 pps	Pin 3
1 pps	Pin 4
GND	Pin 6

b. Duty Cycle: 80/20%

c. 1K pps: 50/50% (In translator mode)

d. On Time Edge: Negative

e. Output Levels: Logic "0" $\leq$ 0.4 VDC
Logic "1" $\geq$ 2.4 VDC

f. Source Impedance: DTL/TTL Compatible

2.2.3 Parallel Outputs (Optional)

a. (J4) 44 bit BCD time of year (millisecond, S, M, H, D)

b. (J5) 32 bit time of year (S, M, H, D)

c. Output Levels: Logic "0" $\leq$ 0.4 VDC
Logic "1" $\geq$ 2.4 VDC

d. Source Impedance: DTL/TTL Compatible

e. Sample Time: Approximately 1.5 μsec pulse to a logic "0" at update time (data is changing during pulse time). Sample time rate is normally 1 pps or 1 kpps (seconds or milliseconds output resolution).

2.2.4 J3 - Bi-Level Five Rate Slow Code (Optional)

a. Format: DATUM Slow Code

b. Amplitude: Adjustable - 10V (maximum) on the "mark" pulse.

c. Source Impedance: 100 ohms

d. Pin 5 - CODE
Pin 6 - GND

2.3 TIME BASE

a.	Type:	Crystal Controlled Oscillator
b.	Frequency:	1 MHz
c.	Stability:	$\pm 5 \times 10^{-6}$

2.4 ENVIRONMENT

a.	Temperature:	0°C to +50°C
b.	Humidity:	Up to 95% relative

2.5 PHYSICAL

a.	Panel Height:	1-3/4 inches
b.	Chassis Width:	17 inches
c.	Chassis Depth:	18 inches

SECTION III

OPERATING PROCEDURE

3.1 GENERATE MODE

a. Apply 115V AC power to J6

b. Turn on instrument by moving the PWR switch, located on the front panel, to the ON position.

c. Rotate the MODE switch to the HOLD position. (Display should be stationary.)

d. Preset the time of day using the following procedure:

1. Start with the least significant digit (unit seconds) and in progression finish with hundreds of days.
2. Select the number to be preset into each decade with the Preset thumbwheel switch.
3. Press the pushbutton under each decade to enter the PRESET number into the output register.

e. Rotate the MODE switch to the GEN position. At the preset start time, press the START pushbutton.

f. The display will now update at a 1 pps rate and all outputs will be available on their respective output connectors.

3.2 TRANSLATE MODE

a. Apply power as in steps a and b of the GENERATE MODE procedure.

b. Place a standard 1 kHz modulated IRIG B code on BNC connector J1 located on the rear of the unit. It does not matter if the code format has been modified to remove the control functions or straight binary seconds as this portion of the time code is not used for decoding purposes in the 9300. (See 9300 specifications for modulation ratio, frequency range and amplitude requirements.)

c. Rotate the MODE switch to the TRANS position.

d. Place the FWD/REV switch to the FWD position.

e. After allowing approximately one minute after turn-on for the AGC to settle, the 9300 will automatically synchronize to the input time code.

3.3 BY-PASS OPERATION (See also paragraph 3.12)

a. Select TRANS. The 9300 will respond to each time frame of the input code. Any degradation of the input code may cause an erroneous reading on the 9300 Time Code Generator-Reader.

b. Select 4. The 9300 will sync to the input code, then automatically lock out its own sync circuits and just monitor the input code for time differences. Frame errors are counted; however, the 9300 synchronization is not disturbed unless four consecutive errored frames are counted. If frame errors are separated by a valid frame, the error counter is reset to zero; therefore, resynchronization can only take place on the fifth frame after counting four consecutive errored frames. This mode can be extremely useful when input time code is noisy or being derived from a poor or spliced tape.

c. oo BY-PASS. Note: Prior to selecting this position, the 9300 must be synchronized in either the TRANS, 1, 2, 4, or 8 position. After synchronization, rotate the MODE switch to the oo Bypass position. Once in this mode, all synchronizing functions are locked out and the 9300 will act as an elapsed time generator updating on the carrier rate of the input code.

3.4 DIRECTION CONTROL

The 9300 is provided with manual direction control and is operated by means of a front panel mounted toggle switch, INPUT FWD/REV. For forward operation place this switch in the FWD position. For reverse translation, place the switch in the REV direction.

3.5 INPUT CODE POLARITY CONTROL

The 9300 includes provisions to compensate for inverted polarity input codes. This is done with a front panel mounted toggle switch, INPUT +/-. For normal operation, this switch should be placed in the (+) position. For inverted polarity input codes, place the switch in the (-) position.

3.6 INTERNAL FILTER CONTROL

An internal 3 kHz low pass filter has been provided in the 9300, for use in playback (X1 speed ratio) operation. To activate the filter, place the front panel mounted FILTER IN/OUT switch to the IN position.

3.7 TAPE SEARCH OPERATION (Optional) (See Note Below)

a. Connect the 9300 to the Tape Search unit as described in the Tape Search unit instruction manual.

b. Insure that the FWD/REV switch is in the FWD position and that the FILTER switch is in the IN position.

c. A logic "1" on Pin 45 of J4 will program the 9300 for forward operation, a logic "0", for reverse operation.

d. A logic "1" on Pin 49 of J4 will activate the low pass filter, a logic "0" will de-activate the filter.

e. A logic "0" Pin 47 of J4 will inhibit updating of the 9300.

3.8 5 RATE SLOW CODE (Optional)

The PRESET thumbwheel switch serves a dual function when the Slow Code option is installed. In addition to serving in the PRESET function, positions "1" through "5" select the desired frame period (see slow code drawing in Section V). Position "0" de-activates the Slow Code circuitry.

3.9 INPUT CODE SELECT (Optional)

Rotate the MODE A/B/E switch to program the 9300 to accept either IRIG A, IRIG B or IRIG E as the input code.

3.10 ADVANCE/RETARD (Optional)

a. Preset and start the generator as described in paragraph 3.1 above.

b. Sync an oscilloscope on the "on-time" edge of an external reference pulse. (1 PPS).

c. Observe the "on-time" edge of the equivalent local pulse rate. If the local pulse appears to the right of the reference, the 9300 is "late." If the local pulse occurs to the left, the 9300 is "early."

d. Select the greatest Advance/Retard rate (refer to SWITCH & CONTROL LOGIC (11) drawing for rate identification) which will not overcorrect for the offset in one second. For example: for an offset of 5 milliseconds, the proper rate would be 1 millisecond/second, as 10 milliseconds/sec would overcorrect.

NOTE: When connected to the Tape Search Unit and Playback speeds of greater than 1:1 is desired disconnect P4 PIN 49 (SEARCH) in the Tape Search Cable and set the 9300 front panel FILTER switch to the OUT position (see Paragraph 3.6).

e. If the local pulse is "early," press the RET pushbutton. If the local pulse is "late," press the ADV pushbutton. Observe that the local pulse appears to move toward the reference pulse.

f. When the local pulse is within one second correction capability, select the next slowest correction rate.

g. Continue in this manner until the local pulse is alligned to within the maximum resolution of the Advance/Retard circuit.

3.11 EXTERNAL START (Optional)

a. Connect the external start pulse (1 PPS) to the INPUT BNC on the front panel. Place the WWV/DC switch in the appropriate position in accordance with the type signal to be used. Observe that the TICK indicator blinks at a 1 PPS rate.

b. If a WWV "tick" is being used, rotate the LEVEL control to the maximum counter-clockwise position. Adjust this potentiometer clockwise to obtain a steady blinking of the TICK indicator. Setting the control more clockwise than required to obtain a reliable indication may result in an unreliable start.

c. Preset the generator as described in steps 3.1. Rotate the MODE switch to the GEN position.

d. After the "Tick" which occurs one second prior to the preset start time, press the ARM pushbutton. The ARMED indicator will light.

e. The next "Tick Pulse" will start the generator.

3.12 DETAILED BY-PASS OPERATION

When this switch is set to "0" (TRANSLATE), the instrument monitors the input code and responds to each time frame of the input code. If the coded input is erroneous, the unit outputs the incorrect input value on both the visual display and the optional BCD output. However, the ERROR indicator is enabled (because a difference exists between the input and internal time values). This error status will remain until a subsequent code frame is input which is in agreement with the internal time value.

When this switch is set to "4", the instrument monitors the input code and if one or more frames are in error (up to 4), continues to properly update the displayed and BCD outputs by utilizing the 1 kHz carrier of the time code. Two (2) conditions affecting the ERROR indicator are as follows:

a. Less than four (4) consecutive 'erroneous' frames. The ERROR indicator is energized as long as a difference in time value exists between the input code and the internal time registers. At the end of a frame received in agreement with the internal time value, the ERROR indicator is de-energized.

b. Four (4) or more consecutive 'erroneous' frames.

   The ERROR indicator is energized as long as a difference in time value exists between the input code and the internal time registers. During the fifth consecutive frame, the time value

of the input code is entered into the internal time register. If the sixth consecutive frame of the input agrees with the updated time value in the internal time register, the ERROR indicator is de-energized at the end of this frame. However, if the sixth frame of the input code does NOT agree with the updated time value in the internal register, the input code value is again entered into the internal register and the next frame is again examined for agreement with the 'new' time value. The ERROR indicator remains energized and each subsequent frame time value is entered until time value agreement is found.

When the switch is set to "∞" (infinity), the instrument acts simply as an elapsed time generator, updated from its last time value by the carrier input. The ERROR indicator is energized when a difference in time value exists between the input time code and the internal time register and is de-energized at the end of the first frame found to be in agreement. Entering of input code time value(s) is inhibited whenever the switch is in the "∞" position.

Thus, the ERROR indicator is energized whenever (irrespective of switch positior a time-value difference is detected between the code and the internal time regis Further, this status is de-energized at the end of the first subsequent code fra time value found in agreement with the internal time register. Therefore, the effect of the switch positions is to allow entering (jamming) of the input time code value into the internal time register under the following conditions:

a. "0" - each frame
b. "1" - the frame following a detected 'errored' frame
c. "2" - the frame following two (2) consecutive detected 'errored' frames
d. "4" - the frame following four (4) consecutive detected 'errored' frames
e. "8" - the frame following eight (8) consecutive detected 'errored' frames
f. "∞" - never

Finally, from the above examples, it may be discerned that the 'meaning' of the energized state of the ERROR indicator is that a difference in time value exists between the input code time value and the internal register time value and that the de-energized state of this status means there is no detected difference in these values.

SECTION IV
ADJUSTMENTS

The following is a list of adjustments which are basic to the 9300 Time Code Generator/Reader and includes those assemblies which are basic options. In the case of "Potentiometers," they are set at the factory to a nominal setting as indicated in ( ). However, the user should refer to the top assembly drawing for the location of these variables and adjust them for users specific requirements.

1. SINEWAVE SHAPER/MODULATOR ASSEMBLY
   a. R17 Level Adjustment. Range 0 to 10V peak to peak on the mark amplitude of the output code (3V p-p).
   b. R15 Modulation Ratio Adjustment. Range 2:1 - 4:1 mark to space ratio on the output code (3:1).
   c. R7 Phase Adjustment. Sets the phase of the carrier frequency so there is no discontinuity when amplitude modulation takes place.

2. POWER SUPPLY ASSEMBLY
   a. R10 adjusts the output level of the +5 volt regulator. Should be set to +5V ±2%.

3. SLOW CODE ASSEMBLY (Optional)
   a. R12 adjusts the output level (+6V mark amplitude)

SECTION V

THEORY OF OPERATION

5.1 LOGIC DESCRIPTION AND USE

The 9300 is depicted by several drawings. One of these is the top assembly drawing which shows the physical location of the assemblies that are contained within the instrument. This print should be used to locate connectors on the rear panel and for quick reference to the physical location of any of the assemblies or controls.

In the title block of each logic print is a circled number. For instance, the IRIG basic print (Minor Time) has circled number (8) in the title block. The IRIG basic print (Major Time) has circled number (9). The LED display has circled (12) in the title block. Except for terms originating within the drawing being studied, this reference number will precede each term, showing the sheet of logic upon which it originated. To use these numbers, simply observe the term, look at the term reference number in front of the term, then select the print that has this reference number in the title block. This print will show the point of origin of the term you are trying to find. This provides a convenient means of getting back and forth from various pages of these logics.

Each time a term reference number will refer you back to the source of that signal. In each of the logics there will be a number such as A4, A8, A11, etc. These number refer to the physical location on this assembly for that particular integrated-circuit element. In order to determine a physical location of an integrated circuit, one would merely refer to the top assembly drawing. In the lower left-hand corner of this drawing, each assembly contained within the instrument is listed, prefixed with a code letter, (Ⓐ Ⓑ Ⓒ etc.) them, by referencing the mechanical view of the top of the instrument, look for the board labeled with that code letter. Examine the board until the desired integrated circuit is located.

All references in this discussion will be based on the circled term reference numbers located in the title blocks of all logic prints. The reader should be familiar with the above before preceeding.

5.2 GENERAL

The Model 9300 is both a time generator and a time translator. A time generator is a device which takes a referenced frequency and divides it so as to accumulate or "count" time intervals. A time translator is a device which requires a serial coded input and "decodes," or "translates" this input to some other form, usually parallel time data.

In order to better understand the logic organization of the 9300, let's first review the basic configuration of typical timing units.

Figure 5-1 shows a simplified diagram of a typical Time Code Generator. The significant sections of a Time Code Generator are:

a. Frequency Source - Usually a crystal-controlled oscillator.

b. Minor Time Counters - The purpose of these counters is to develop scan terms and rates required to develop the serial code format or to be used for parallel outputs. They also supply a 1-pps signal that is used to update the Major Time Accumulator.

c. Major Time Accumulator - This section is a counter whose function is to store the time-of-year data. It is incremented by the 1 pps clock output of the frequency dividers. Its outputs are buffered and used for parallel outputs or they are scanned by the encoder and outputted in a serial format.

d. Counter Control - This section synchronizes the time accumulator and includes switches to select and enter the time-of-day into the Major Time Accumulator.

e. Parallel-to-Serial Converter - This section consists of scan gates that serialize the contents of the accumulator into a continous pulse train.

TYPICAL TIME CODE GENERATOR

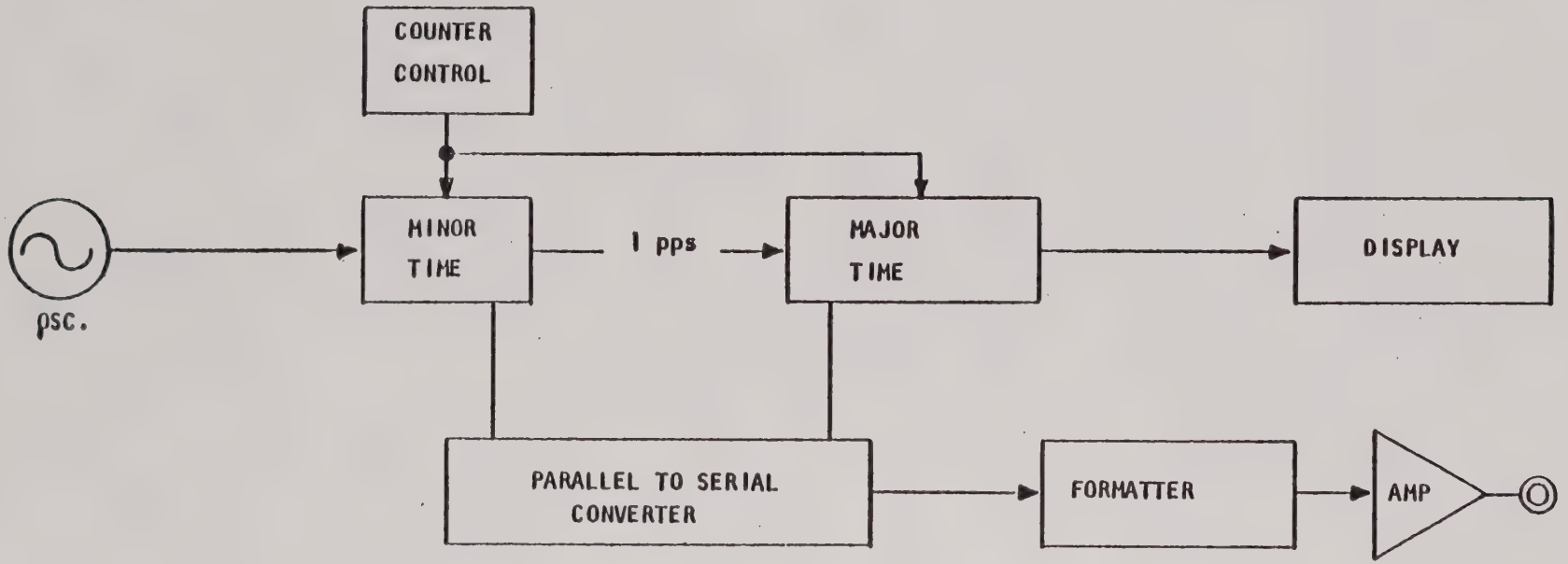


FIGURE 5-1

f. Formatter - This section uses pulse rates from the minor time counter to obtain the pulse widths and index pulses required to provide the format defined by the type of time code being generated. This format is then usually combined with a sinewave to provide an amplitude-modulated signal.

g. Output Amplifier - This section provides the required output drive and signal levels of the formatter output.

h. Display - This section interfaces the generator with the operator.

Figure 5-2 shows a simplified diagram of a typical Time Code Translator. The significant points to a Time Translator are:

a. Input Amplifier - Usually this is an AGC type amplifier. Its function is to provide a constant amplitude signal to the decode and detection circuitry.

b. Serial to Parallel Converter - This is the heart of the unit. Its function is to detect digital data in the input format and assign it to storage in the time accumulator. This portion contains the necessary circuits to synchronize the frequency dividers.

c. Frequency Dividers - These counters divide the carrier frequency. Once synchronized by the decoding circuitry in the serial-to-parallel section, this counter provides the terms necessary to index the digital data contained in the input code. This allows the locating of each code bit and the proper assignment to accumulator storage. Also important, they provide a 1 pps signal to update the Time Accumulator.

d. Time Accumulator - This counter stores the value being read from the input code. It is updated with the 1 pps signal from the frequency dividers and is permuted to count in the format of the input time code (usually seconds, minutes, and hours). Day-of-year may sometimes be provided if required

TYPICAL TIME CODE TRANSLATOR

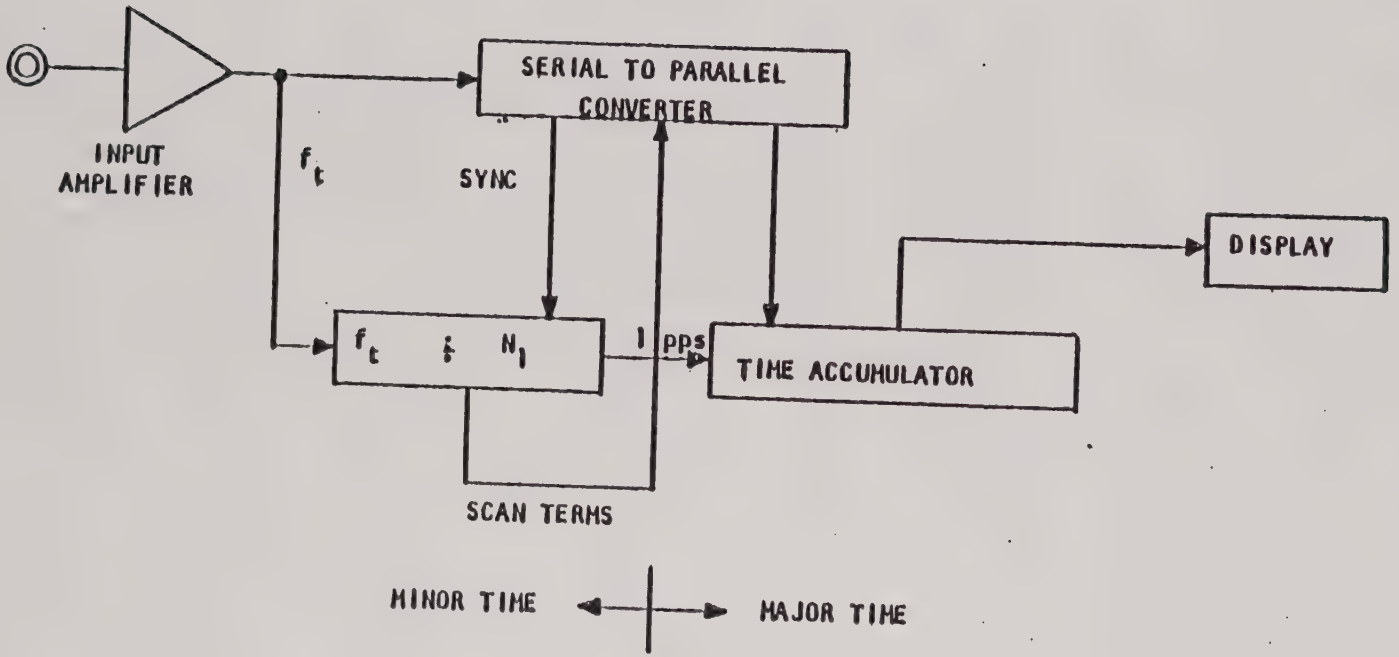


FIGURE 5-2

and it is contained in the input time code. The Time Accumulator is the basis for most outputs required by the unit.

e. Display - This section takes the Time Accumulator data and displays it for the user.

Now if we combine the two functions, taking advantage of circuitry found common to both, we obtain a Time Code Generator/Translator (Figure 5-3). Logic functions which are common, i.e., those which need not be duplicated are:

a. Frequency dividers (all of those in the translator and at least half of those in the generator).
b. Time Accumulator
c. Display

Of course, the power supply and chassis are shared.

5.3 DETAILED LOGIC DESCRIPTION

This description will be referenced only to the term reference numbers that are contained within the title block of each individual logic print. Before proceeding, the reader should be familiar with paragraph 5.1, LOGIC DESCRIPTION AND USE.

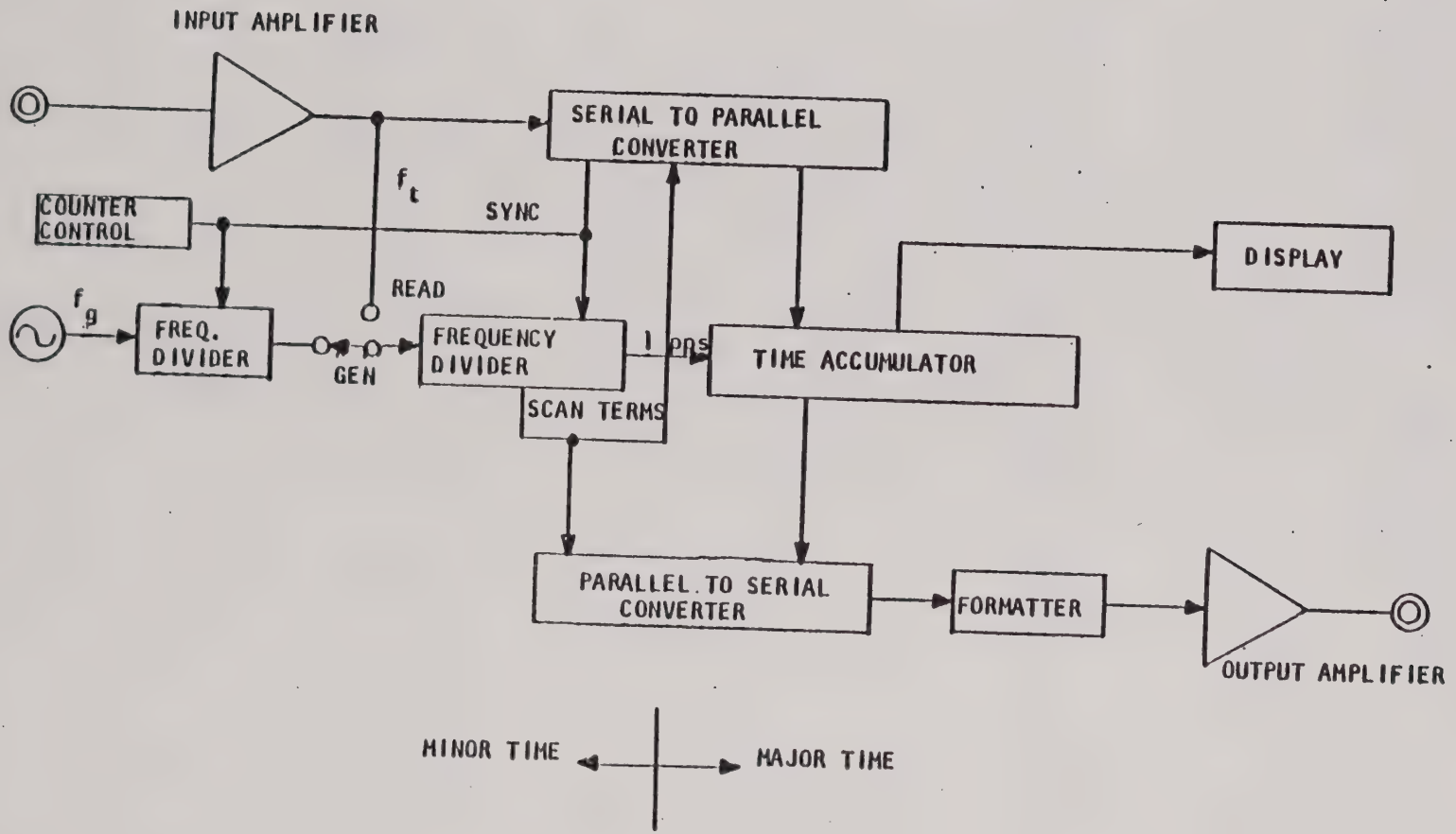
(1) AGC

The automatic gain control amplifier assembly contains the input amplifier and the code strippers required to normalize the input and derive the necessary clock signals for the decoder.

The AGC amplifier is wideband so as to make the unit operational where variations of input signal frequency as well as amplitude is experienced such as in tape search applications.

Generally if a translator is used as a single purpose unit such as to only translate code at a single rate and display it, the AGC circuits can be narrowband. To make the unit more adaptable to different types of applications we have provided a 100 MV to 10 volt dynamic range and a frequency response of 25 Hz to 300 kHz. The circuit does not require adjustment over this range.

TYPICAL TIME CODE GENERATOR/TRANSLATOR



After the input signal is normalized by the AGC, preset level comparators develop clock signals used for decoding. ØA which occurs at the positive zero axis crossing of the carrier, is used throughout the unit for clocking and synchronization. ØC is the mark clock which occurs only each half cycle of the carrier modulation (mark amplitude cycles).

Figure 5-4 shows a typical modulated signal. Two cycles are modulated. Examples of ØA and ØC are shown relative to the signal. Observe also the other definitions provided.

(2) DECODER

This logic uses the terms ØA, ØB and ØC from the AGC (1) to reconstruct the D.C. envelope of the input code. The logic symbol identified as DF3 represents this reconstructed envelope.

A binary counter is used to count the number of "mark" cycles that are contained during each positive excursion of DF3. Whenever four or more "mark" cycles are counted, the term BIN1 (Binary 1) will go to a logic "one" indicating the presence of a Binary One in the code. When eight "mark" cycles have been counted, the term PIC (Position Identifier Count) will go to a logic "one". The coincidence of PIC with DF3 being clocked off causes the logic term identified as PID (Position Identifier Detector) to go to a logic "one" indicating the detection of one of the ten position identifiers contained within the IRIG format.

Once per frame, the terms PIC, PID and DF2 coincide. This occurs at plus nine milliseconds in IRIG B and the decoded combination is used to fire the frame sync one-shot (FS). This pulse is used to sync the minor time counter (8) to a count of nine. Thus causing the minor time counter to be synchronized with the input time code.

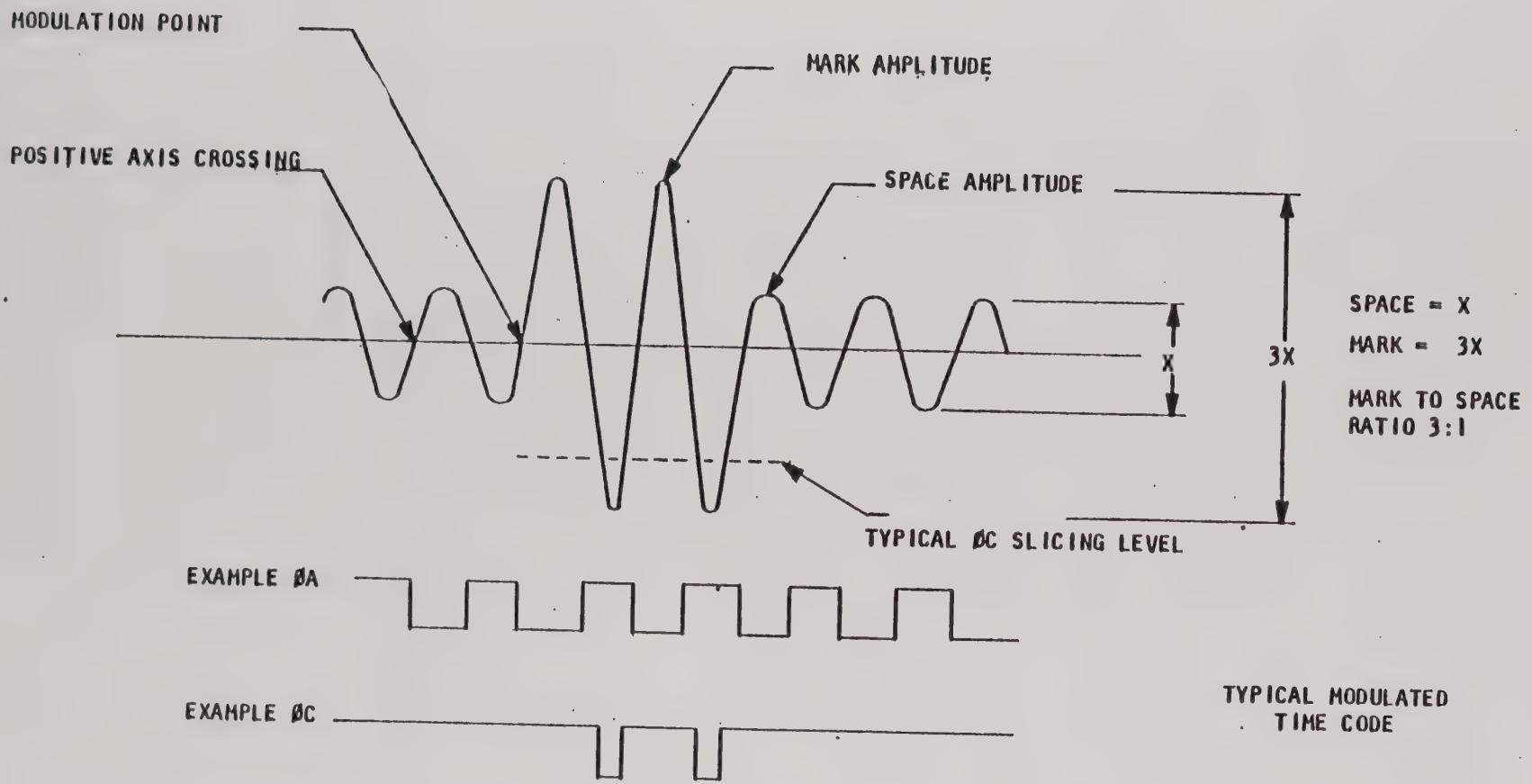

MODULATION POINT
MARK AMPLITUDE
POSITIVE AXIS CROSSING
SPACE AMPLITUDE
X
3X
SPACE = X
MARK = 3X
MARK TO SPACE RATIO 3:1
TYPICAL ØC SLICING LEVEL
EXAMPLE ØA
EXAMPLE ØC
TYPICAL MODULATED TIME CODE

FIGURE 5-4

(3) MODE CONTROL

This logic contains the steering logic necessary to program the unit for the generate or translate mode of operation and to condition the unit for forward or reverse translation and to accept normal or inverted polarity input code.

In the generate mode, the unit is programmed for forward operation. In the translate mode, forward or reverse translation is controlled by the FWD/REV switch on the front panel or via the rear panel (FWD*) if the optional parallel outputs are installed. A front panel switch conditions the unit to accept normal (+) or inverted (-) polarity input codes.

This logic also contains a four-bit serial-to-parallel converter which converts the serial time information (BINI) from (2) and converts this data to four lines of parallel data (SF1, 2, 4, or 8) in the translate mode. In the generate mode, the contents of the PRESET thumbhweel switch are passed directly through. These outputs are bussed common to the "D" inputs of the major time accumulators on (9). This allows for presetting the desired start time when in the HOLD mode or for loading the time conten from the input code when in the translate mode.

Also contained on this logic is a two-way, four-bit data selector used to select the appropriate clocks for the serial-to-parallel converter (SFS) and the milliseconds counter (CMSC*) as well as two synchronization pulses ($\overline{FS}$* and $\overline{GFS}$*) in the generate or translate mode of operation. The serial-to-parallel converter is clocked by the 1 MHz clock (MCC) in the generate mode and by a decoded term from the Decoder (2) in the translate mode. The milliseconds counter is clocked by either tmSC8 in the generate mode or by ΔA* in the translate mode.

Portions of four logic elements C3, D3, D9 and F9 are cross-gated to form the RUN/HOLD latch. In the generate mode, rotating the MODE switch to the HOLD position causes $\overline{\text{HOLD}}$ to become a logic "0", stoping and resetting the minor time counter (8) and enabling major time preset push-buttons via the term $\overline{\text{PSE}}$.

An "exclusive-or" element, D8 pins 1, 2, and 3 provides for a low-pass filter in the AGC to be activated by either the front panel FILTER IN/OUT switch (1FSC) or via the rear panel ($\overline{\text{SEARCH}}$) from the optional parallel outputs.

(4) SCAN LOGIC

This logic is used to generate the load pulses necessary for strobing the parallel data from the serial-to-parallel converter on (3) into the major time counter (9).

Assignment to the proper group (seconds, minutes, hours or days) is accomplished by logic elements C5 and C7. Assignment to the proper portion of each group is accomplished by logic elements E6 and E7 which generate units data strobe pulses (UDSF, UDSR) and tens data strobe pulses (TDSF, TDSR) for both forward and reverse operation.

Forward or reverse strobes are selected by logic element D7. The two load pulses are factored by the one-shot SPG which limits the strobe pulses ($\overline{\text{SPA}}$ and $\overline{\text{SPB}}$) to a duration of approximately one microsecond. $\overline{\text{SPG}}$ inhibits the strobes in the generate mode; or, in the translate mode, until the selected number of errored frames (EC8) from sync mode logic (5) are counted.

(5) SYNC MODE

This logic performs as a digital filter to prevent erroneous information from being displayed or from disturbing the various outputs.

The output of the IRIG Encoder ($\overline{DCSC}$) (32) is serially compared with the comparable decoder output ($\overline{DF2}$). IF a discrepancy exists between the two, the error detector flip-flop ECD clocks "on". When ECD is reset at the end of the frame, the error counter element C10 is clocked one time. The setting of the MODE BYPASS switch (1, 2, 4, 8, oo) determines how many errored frames will be counted before the counter output EC8 goes true. When this occurs, the error counter clocks are inhibited and the scan logic is enabled, allowing the input data to be loaded into the major time counter and allowing the minor time counter to be re-synchronized via the term $\overline{GFS}$.

If a valid frame (ECD not clocking on) occurs before reaching the selected number of errored frames (EC8 not clocking true), the error counter is reset via the term $\overline{REC}$. Therefore, the units synchronization will not be distrubed until the selected number of errored frames have been counted.

With the MODE/BYPASS switch in the TRANS position, EC8 is held true continuous therefore the unit is synchronized each frame. With oo selected, the unit is never synchronized to the incoming code and acts as a generator, using the input code carrier as a time base.

The sync mode circuitry is disabled in the generate mode and when operating in the reverse direction.

(7) TIME BASE

This logic provides the 1 MHz time base for the generator. Four time bases are available: Two different 1 MHz crystal oscillators, a 10 MHz crystal oscillator and a divide-by-ten element, or an optional external 1 MHz sine-wave input with a level converter. The output is a TTL 1 MHz pulse (MCC).

(8) MINOR TIME

This logic consts of a series of decade counting units (DCU's) which accept the 1 MHz clock from (7) and divides it to 100 KPPS (μsc8), 10 KPPS (hmsc8), 1 KP (tmsc8), 100 PPS (msc8), 10 PPS (hsc8), and 1 PPS (tsc8). The term $\overline{HOLD}$ prevents the minor time counter from updating and holds each decade reset when in the HOLD mode. Also contained on this logic are four buffers which isolate the four standard pulse rate outputs.

(9) MAJOR TIME

This logic consists of a series of UP/DOWN counters which accept the 1 PPS clock (cUSC) from (8). This clock is divided down to one-pulse-per-minute at B9 pin 6, one-pulse-per-hour at B7 pin 6, one pulse-per-day at B5 pin 2 and one pulse-per-thousand days at B2 pin 7.

The tens-of-seconds counter, B9, is forced to recycle at the end of sixty seconds by one-shot RTS which "fires" at a decoded count of sixty (TSC4·TSC2). Similarly, the tens-of-minutes counter, B7, is reset at sixty minutes by RTM and the hours counters B5 and B6 at twenty-four hours by RHC.

Presetting the major time to the desired start time in the HOLD mode or to the contents of the input time code in the translate mode is accomplished by lowering the preset pin 11 of the selected decade to a logic "0". This is done via the pushbuttons beneath the associated digit of the display in the HOLD mode and via the strobe pulses from (4) in the translate mode. When this is done, the selected decade is preset to the state of the four preset lines, SF1, 2, 4, and 8.

(10) DISPLAY DRIVERS

This logic consists of a series of four-to-seven line decoders which converts the four-line BCD output of the major time counter (9) to the seven-line format required by the L.E.D. Display (12).

(11) SWITCH & CONTROL LOGIC

This print serves as an interface drawing used to indicate interconnections between the various assemblies within the unit as well as illustrating the various input and output connectors, with the exception of the parallel outputs which are described in a separate logic description.

(12) LED DISPLAY

This logic consists of nine seven-segment Light Emitting Diode (LED) display units. Each converts the seven-segment outputs from (10) to a visible display for interface to the user.

IRIG B Encoder (32)

Terms from the minor time counter are used to sequence multiplexer chips A9 through A14. The output of the major time counter is then scanned and grouped into ten bit serial words, X0 through X4. X0 contains the serial time information of units of seconds and tens of seconds. X1 contains the serial time information of units of minutes and tens of minutes. X2, units hours and tens of hours, X3 unit days and tens of days, and X4, hundreds of days. The terms X0 through X4, are again serially selected bit by bit by means of IC A15 and outputted as the term $\overline{D}$ on pin 6 of A15. $\overline{D}$ now represents the time of year information in a serial form.

Although the data at this point is serial, it is still not in an IRIG B format. The IRIG B format is generated by the output term DCSC and the collection of gates that control this reset line on pin 4 of A7. DCSC is enabled at a 100 pps rate and clocked true by the 1000 pps clock applied to pin 12 of A7. The reset occurs whenever the enable term of pin 4 a A7 is set to a "one" state. This occurs at 2 milliseconds if neither a position identifier is contained at that particular period or a binary "1" is not present in the code. However, if a binary "1" is present in the serial time information being generated at A15, pin 6, the reset of DCSC is delayed until the count of 5, or 5 milliseconds.

At a 10 pps rate, at a count of 9, the DCSC reset enable is delayed for 8 counts, thus generating an 8 millisecond wide position identifier. Once per second, at T-zero time, A7 pin 5 (XGY0) is set true. This generates the frame reference pulse of the IRIG B time code and prevents the first pulse of each frame period from being reset until a count of 8 milliseconds. The output of DCSC is buffered and presented as the DC shift code output.

On (32A) the output of A8 pin 6 is a 1 KC squarewave. The odd harmonics are filtered from the squarewave to generate a sinewave is modulated by the DC code envelope ($\overline{DCSC}$) by means of FET Q1 and IC A17. The output of A17, pin 1, is attenuated by a potentiometer, R17, which is used to set the level of the IRIG B modulated serial time code. The output amplifier consists of A17, Q2 and Q3. The gain is set by resistors R18 and R20 and is set to be a fixed gain of 10. The modulated output is available on E6.

POWER SUPPLY (49)

The Power Supply furnishes regulated ±15V DC and +5V DC to the unit. The ±15V DC regulators are integrated circuit regulators with internal fault protection. The +5V DC regulator employs and LM305 voltage regulator and is of the switching type.

The LM305 is essentially an operational amplifier with a built-in Zener reference. When the voltage on pin 6 falls a few millivolts below that of the internal reference, Q1 and Q2 are turned on and the voltage on the 5-volt line begins to rise. Q1 and Q2 turn off as the voltage on A1-6 rises above the reference level. L1 tries to maintain constant current flow and current begins to flow through CR2. This continues until Q1 and Q2 are aga turned on and the cycle is repeated.

The switching regulator is thus an efficient method of obtaining constant 5V DC from an unregulated source, since power is dissipated in Q1 only when it is on or changing states.

For 5 volts from a 23V source, Q1 is on approximately 25 percent of the tim Q3 and Q4 provide short circuit protection by forcing the regulator to decr the output voltage when the current through R7 becomes excessive. When the output voltage becomes too high, CR5 conducts and CR6 is turned on. The current limit circuit then shuts down the regulator.

OPTIONS

Described in the following paragraphs are some (but not all) of the options and capabilities which are available. For instance, Control Functions and/or Binary seconds can be encoded and inserted into the serial code formats or translated from the input codes. These particular capabilities, although not listed would most likely be used in conjunction with one or more of the other options.

A-B-E CODE SELECT (13) (OPTION)

The Code Select option is used whenever multi code translation is required. Whenever the option is installed in the unit, a front panel switch allows the operator to select the IRIG code (A, B and or E) the unit is to translate.

ADVANCE/RETARD (20) (OPTION)

When in the generator mode of operation this assembly, in conjunction with front panel switches, allows the operator to slew the internally generated update clock in order to align it with an external reference signal.

EXTERNAL START (25) (OPTION)

Allows the unit to be started "on time" from an external WWV TICK signal or a DC pulse.

17 BIT BINARY CONVERTER (27) (OPTION)

Provides parallel buffered 17 bit Binary outputs (seconds, minutes, hours) of the major time counter. 10 bits of Binary milliseconds can also be provided.

SLOW CODE (29) (OPTION)

Converts parallel BCD information (major time), in conjunction with a front panel switch, to a bi-level 5 rate serial Slow Code format.

PARALLEL OUTPUTS (30) (OPTION)

Provides parallel buffered BCD outputs of the major and or minor time counter contents. Also provides for other output timing signals and for external control of the Time Code Translator (e.g. Tape Search Control) if required.

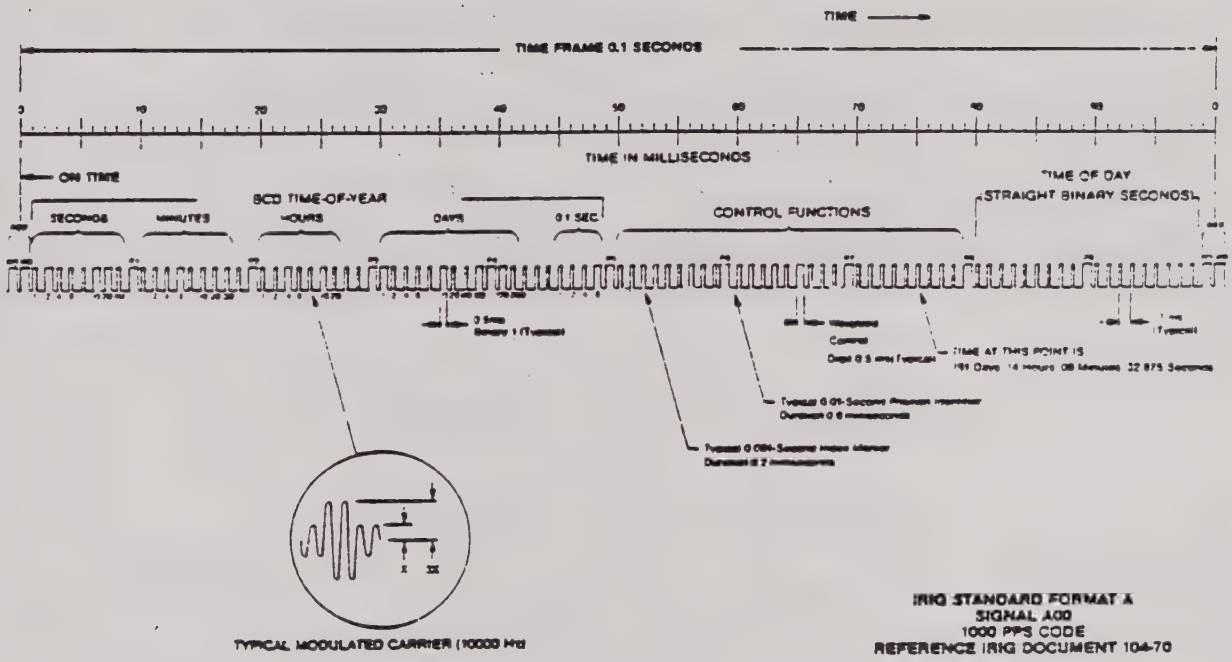
IRIG A ENCODER (31) (OPTION)

This option provides for the generation of the IRIG A Time Code Format (A132). The operation of this assembly is the same as for IRIG B (32). However, since the code rate is 1000 PPS the input timing terms are different and the pulse widths mentioned are decreased by a factor of ten.

IRIG E ENCODER (35) (OPTION)

This option provides for the generation of an IRIG E Time Code Format (E112). The operation of this assembly is the same as for IRIG B (32). However, since the code rate is 10 PPS the input timing terms are different and the pulse widths are increased by a factor of ten.

IRIG FORMAT 'A' — GENERAL



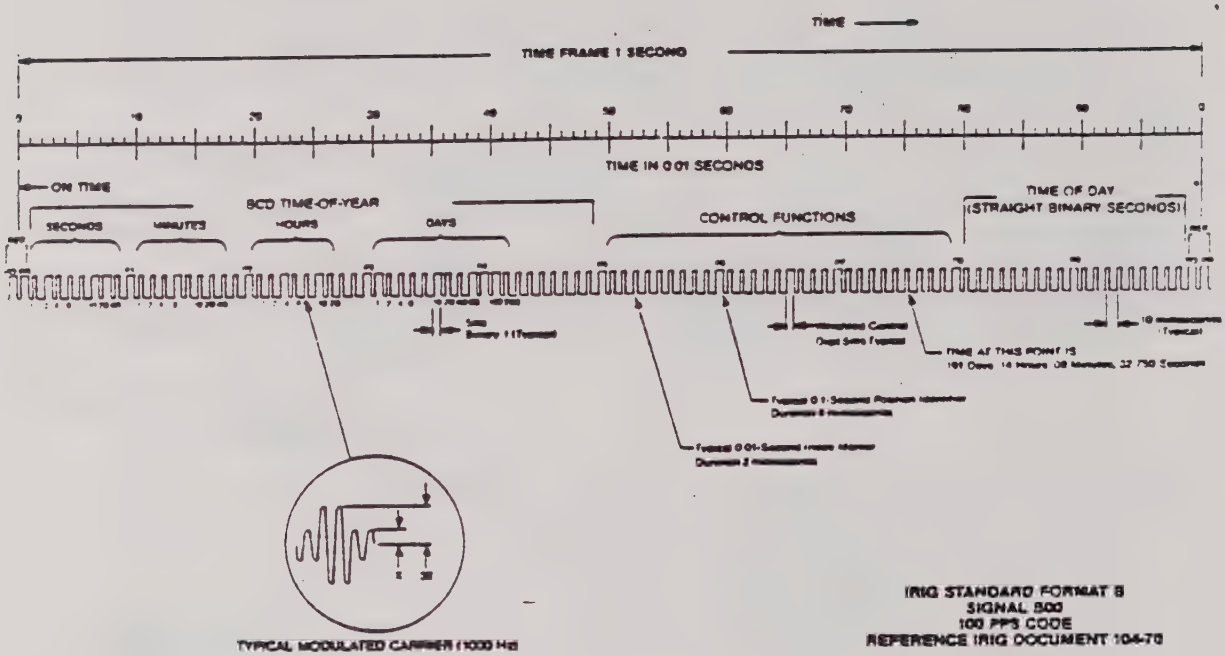
TYPICAL MODULATED CARRIER (10000 Hz)

IRIG STANDARD FORMAT A
SIGNAL A00
1000 PPS CODE
REFERENCE IRIG DOCUMENT 104-70

1. **TIME FRAME:** 0.1 second
2. **CODE DIGIT WEIGHTING OPTIONS:** BCD, SB or both:
   a. Binary Coded Decimal Time-of-Year CODE WORD — 34 binary digits.
      (1) Seconds, minutes, hours, days and 0.1 seconds. Recycles yearly.
   b. Straight Binary Time-of-Day CODE WORD — 17 binary digits.
      (1) Seconds only. Recycles each 24 hours. (86399)
3. **CODE WORD STRUCTURE:**
   a. **BCD.** Word begins at INDEX COUNT 1. Binary-coded elements occur between POSITION IDENTIFIER ELEMENTS (seven for seconds; seven for minutes; six for hours, ten for days; four for 0.1 seconds) until the CODE WORD is complete. A POSITION IDENTIFIER occurs between decimal digits in each group to provide separation for visual resolution.
   b. **SB.** Word begins at INDEX COUNT 80. Seventeen binary-coded elements occur, with a POSITION IDENTIFIER between the 9th and 10th binary-coded elements.
4. **LEAST SIGNIFICANT DIGIT:** Occurs first, except for fractional seconds information, which occurs following the day-of-year information.
5. **ELEMENT RATES AVAILABLE:**
   a. 1000 per second (basic Element rate)
   b. 100 per second (POSITION IDENTIFIER rate)
   c. 10 per second (Frame rate)
6. **ELEMENT IDENTIFICATION:**
   a. 'On-Time' reference point for each Element is its leading edge.
   b. INDEX MARKER duration: 0.2 milliseconds (Binary Zero or uncoded Element)
   c. CODE DIGIT duration: 0.5 milliseconds (Binary one)
   d. POSITION IDENTIFIER: 0.8 milliseconds
   e. REFERENCE MARKER: Two consecutive POSITION IDENTIFIERS.

   (The 'on-time' point, to which the CODE WORD refers, is the leading edge of the second POSITION IDENTIFIER.)
7. **RESOLUTION:** 1 millisecond (unmodulated); 0.1 millisecond (modulated).
8. **CARRIER FREQUENCY:** 10 kHz when modulated.

IRIG FORMAT 'B' — GENERAL

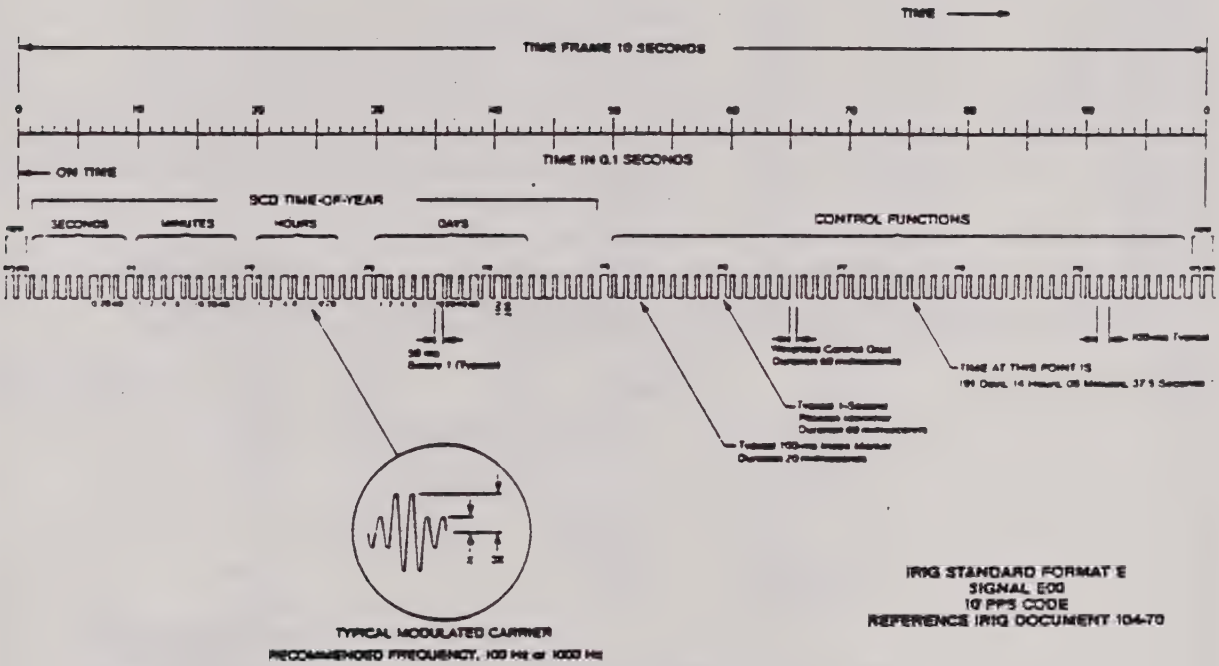


TYPICAL MODULATED CARRIER (1000 Hz)

IRIG STANDARD FORMAT B
SIGNAL B00
100 PPS CODE
REFERENCE IRIG DOCUMENT 104-70

1. **TIME FRAME:** 1.0 second.
2. **CODE DIGIT WEIGHTING OPTIONS:** BCD, SB or both:
   a. Binary Coded Decimal Time-of-Year CODE WORD — 30 binary digits.
      (1) Seconds, minutes, hours and days. Recycles yearly.
   b. Straight Binary Time-of-Day CODE WORD — 17 binary digits.
      (1) Seconds only. Recycles each 24 hours. (86399)
3. **CODE WORD STRUCTURE:**
   a. **BCD:** Word begins at INDEX COUNT 1. Binary-coded elements occur between POSITION IDENTIFIER ELEMENTS (seven for seconds, seven for minutes; six for hours; ten for days) until the CODE WORD is complete. A POSITION IDENTIFIER occurs between decimal digits in each group to provide separation for visual resolution.
   b. **SB:** Word begins at INDEX COUNT 80. Seventeen binary-coded elements occur with a POSITION IDENTIFIER between the 9th and 10th binary-coded elements.
4. **LEAST SIGNIFICANT DIGIT:** occurs first.
5. **ELEMENT RATES AVAILABLE:**
   a. 100 per second (basic Element rate)
   b. 10 per second (POSITIVE IDENTIFIER Rate)
   c. 1 per second (Frame Rate)
6. **ELEMENT IDENTIFICATION:**
   a. "On-Time" reference point for each Element is its leading edge.
   b. INDEX MARKER duration: 2 milliseconds (Binary zero or uncoded Element)
   c. CODE DIGIT duration: 5 milliseconds (Binary one)
   d. POSITION IDENTIFIER duration: 8 milliseconds
   e. REFERENCE MARKER — one per second: Two consecutive POSITION IDENTIFIERS.
      (The "On-Time" point, to which the CODE WORD refers, is the leading edge of the second POSITION IDENTIFIER.)
7. **RESOLUTION:** 10 milliseconds (unmodulated), 1 millisecond (modulated).
8. **CARRIER FREQUENCY:** 1 kHz when modulated.

IRIG FORMAT 'E' — GENERAL

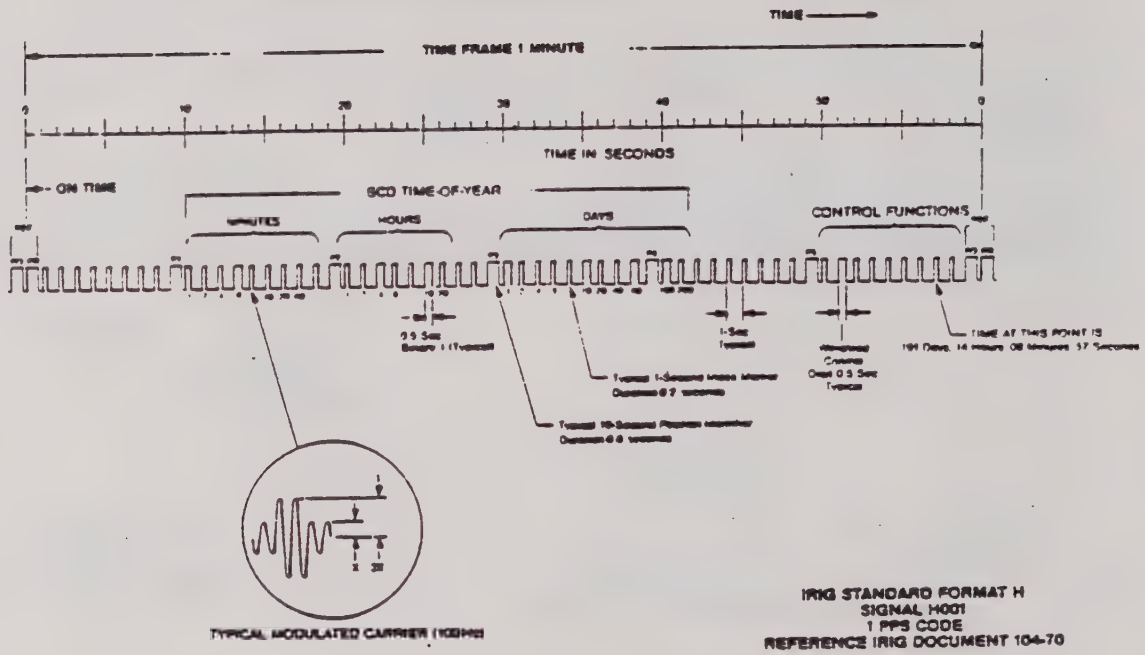


IRIG STANDARD FORMAT E
SIGNAL E00
10 PPS CODE
REFERENCE IRIG DOCUMENT 104-70

1. **TIME FRAME:** 10 seconds
2. **CODE DIGIT WEIGHTING:** BCD: Time-of-Year CODE WORD — 26 Binary Digits, Seconds, minutes, hours and days; recycles yearly
3. **CODE WORD STRUCTURE:**
   BCD: Word begins at INDEX COUNT 8. Binary-coded Elements occur between POSITION IDENTIFIER ELEMENTS (three for seconds, seven for minutes; six for hours, ten for days) until the CODE WORD is complete. A POSITION IDENTIFIER occurs between decimal digits in each group to provide separation for visual resolution.
4. **LEAST SIGNIFICANT DIGIT:** Occurs first.
5. **ELEMENT RATES AVAILABLE:**
   a. 10 per second (basic Element rate)
   b. 1 per second (POSITION IDENTIFIER Rate)
   c. 0.1 per second (Frame Rate)
6. **ELEMENT IDENTIFICATION:**
   a. "On-Time" reference point for each Element is its leading edge.
   b. INDEX MARKER duration: 20 milliseconds (Binary zero or uncoded Element)
   c. CODE DIGIT duration: 50 milliseconds (Binary one)
   d. POSITION IDENTIFIER duration: 80 milliseconds (Refers to the leading edge of the succeeding Element.)
   e. REFERENCE MARKER (one per 10 seconds): Two consecutive POSITION IDENTIFIERS.

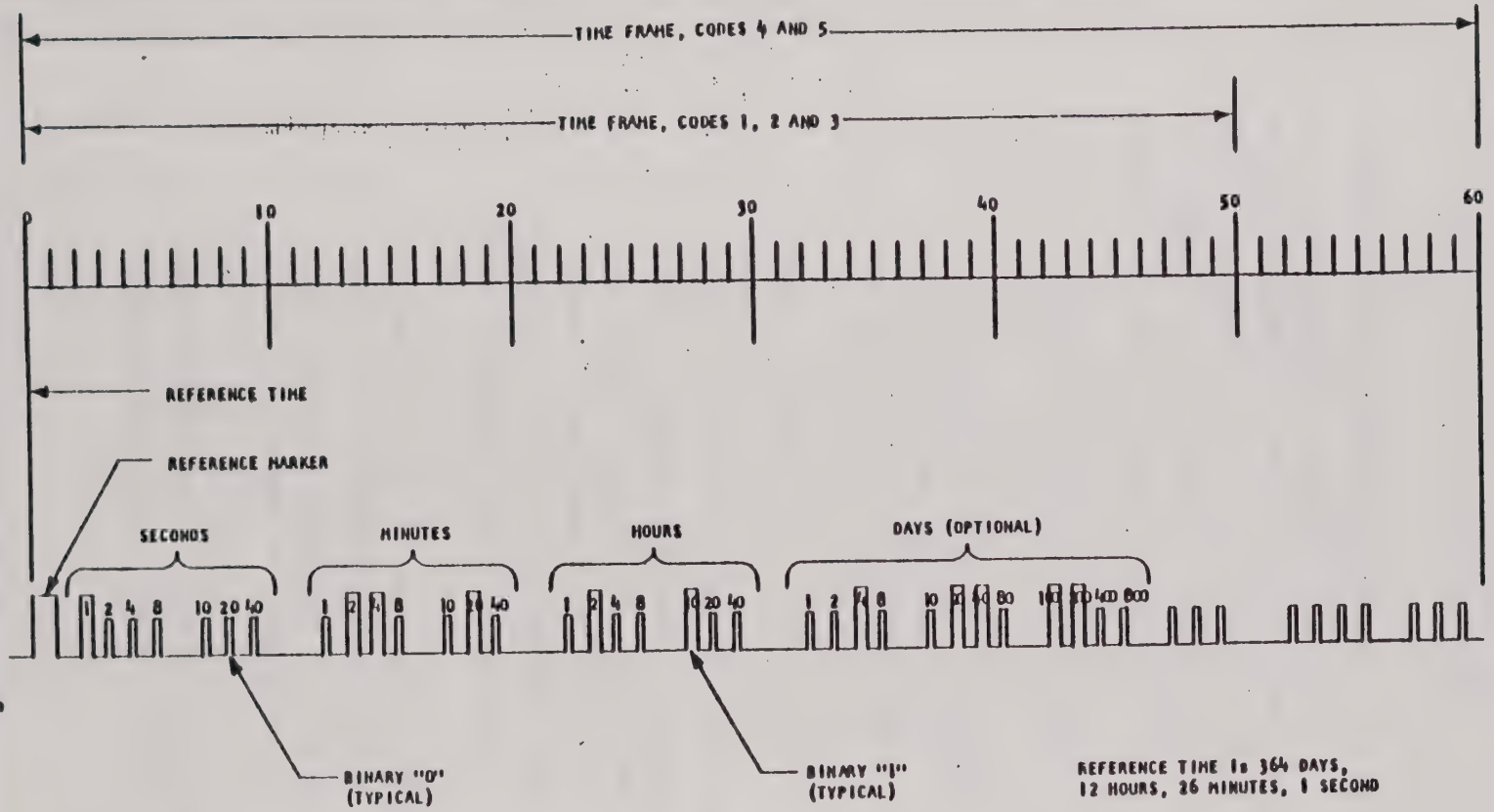
   (The "On-Time" point, to which the CODE WORD refers, is the leading edge of the second POSITION IDENTIFIER.)
7. **RESOLUTION:** 100 milliseconds (unmodulated); 1 millisecond (modulated).
8. **CARRIER FREQUENCY:** 1 kHz or 100 Hz when modulated.

IRIG FORMAT 'H' – GENERAL



IRIG STANDARD FORMAT H
SIGNAL H001
1 PPS CODE
REFERENCE IRIG DOCUMENT 104-70

1. **TIME FRAME:** 1 minute
2. **CODE DIGIT WEIGHTING:** BCD Time-of-Year CODE WORD – 23 binary digits. Minutes, hours and days; recycles yearly
3. **CODE WORD STRUCTURE:** BCD word begins at INDEX COUNT 10. Binary-Coded Elements occur between POSITION IDENTIFIER ELEMENTS (seven for minutes; six for hours; ten for days) until the CODE WORD is complete. A POSITION IDENTIFIER occurs between decimal digits in each group to provide separation for visual resolution.
4. **LEAST SIGNIFICANT DIGIT:** Occurs first.
5. **ELEMENT RATES AVAILABLE:**
   a. 1 per second (basic Element Rate)
   b. 1 per ten seconds (POSITION IDENTIFIER Rate)
   c. 1 per minute (Frame Rate)
6. **ELEMENT IDENTIFICATION:**
   a. "On-Time" reference point for each element is its leading edge.
   b. INDEX MARKER duration: 0.2 seconds (Binary zero or uncoded Element)
   c. CODE DIGIT duration: 0.5 seconds (Binary one)
   d. POSITION IDENTIFIER duration: 0.8 seconds
   e. REFERENCE MARKER: 1 per minute. Two consecutive POSITION IDENTIFIERS (The "On-Time" point, to which the CODE WORD refers, is the leading edge of the second POSITION IDENTIFIER.)
7. **RESOLUTION:** 1 second (unmodulated), 0.01 seconds (modulated 100 Hz); 0.001 seconds (modulated 100 Hz)
8. **CARRIER FREQUENCY:** 1 kHz or 100 Hz where modulated.



CODE	PULSE RATE	FRAME PERIOD	BINARY ZERO	BINARY ONE	FRAME REFERENCE PULSE
1	50 PPS	1 SEC	4 MS	10 MS	20 MS
2	10 PPS	5 SEC	20 MS	50 MS	100 MS
3	5 PPS	10 SEC	40 MS	100 MS	200 MS
4	1 PPS	60 SEC	200 MS	500 MS	1,000 MS
5	1 PPS IOS	10 MIN	2 SEC	5 SEC	10 SEC

datum inc.

BI-LEVEL SLOW CODE REV. A

SECTION VI
MAINTENANCE

The 9300 Time Code Generator/Translator utilizes integrated circuits. There are no moving parts or parts with limited life. There is no periodic maintenance required for the unit under normal conditions. If the unit is exposed to unusual operating conditions such as high dust or high humidity environments, or if the unit is dropped or otherwise damaged, it may be necessary to perform certain inspections and/or repairs.

If it is necessary to inspect the unit, the following should be considered:

1. Always disconnect AC power before removing the instrument cover. To remove the cover, simply remove the screw at the rear panel and slide the cover off to the rear.

2. Make a thorough visual inspection of all circuitry and wiring.

3. Check for physical integrity of all components. Look for burned or cracked components, loose physical damage, leakage of insulation compounds or general physical damage. To aid in overall maintenance and repair, each integrated circuit is mounted in an individual modular socket. Removal or replacement is therfore convenient and easy.

   It should rarely be necessary to replace an integrated circuit; however, if replacement is attempted, be sure that all component leads enter the socket and that no leads are bent under the component or extended out from the socket.

   Check to see that all IC's are firmly mounted in the socket so that good electrical contact is made.

4. Check all switches and connectors for loose or broken wires.

5. If the internal component surfaces and components have an excessive amount of dust deposited on them, use a soft brush and a low pressure stream of air to remove any foreign material.

CAUTION

Do not clean PC boards or small internal components with a stiff brush or solvents since damage to the circuits may result. A high powered vacuum cleaner device should not be used on small internal components.

6. Wipe the external surfaces of the instrument with a soft damp cloth to remove dirt, fingerprints and other foreign material.

7. Replace the cover and reconnect the AC power and input connector. Check operation. If performance does not match or exceed the specifications listed, corrective maintenance is in order.

Printed Circuit Board Repair

Removal and insertion of IC components can be easily made as described above. Should it be necessary to replace conventional components which are soldered to the circuit board, cut the leads of the part near the lead holes. Using a low power (50 watts or less) soldering iron, apply heat sparingly to each cut lead. As soon as the solder melts, slip the lead from the hole and clean the hole with a tooth pick. Clean the board surfaces with isopropyl alcohol. Form the tinned leads of the replacement part and insert in cleaned holes, trimming the leads to extend 1/16-inch beyond the back surface of the board. Only 63/37 solder with a maximum

diameter of 1/16 inch should be used. Solder the leads to the board and use a hemostat, long nosed pliers, or other heat sink on the leads of all semiconductor devices and quarter-watt resistors. Allow the soldered junction to cool before removing the heat sink.

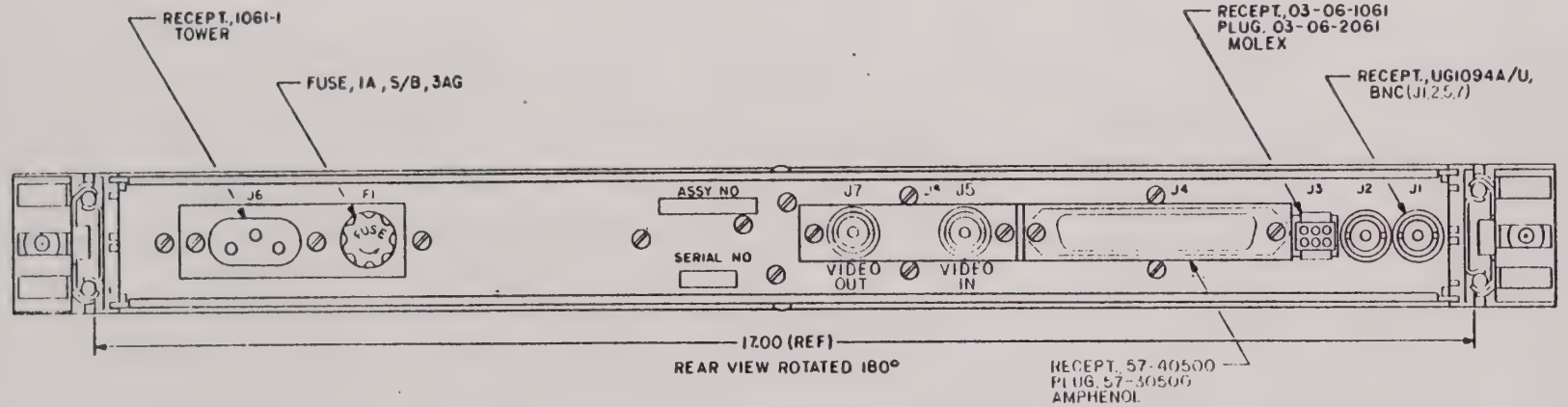
WARNING

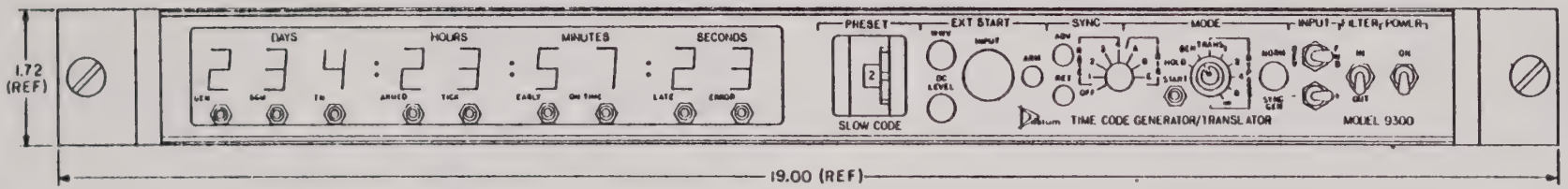
Dangerous high voltages are present in the unit. Use caution at all times when the protective cover is removed.

SECTION VII
LIST OF DRAWINGS

1.	Top Assembly	9300-7053
2.	AGC (1)	16085
3.	IRIG Basic (2)(3)(4)(5)(7)(8)(9)(10)	16543
4.	Switch & Control Logic (11)	9300-8111
5.	LED Display (12)	16549
6.	Parallel Outputs (30)	16635
7.	IRIG B Encoder (32)	16062
8.	Power Supply (49)	16280
9.	Video Time Inserter (60)(61)(62)(63)(64)(65)(66)	17269

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
-	R101 WAS 305	6 11 79	[illegible]
A	REVISED PER ECO T4583	9 10 82	[illegible]





6. SWITCH & CONTROL LOGIC 9300-8319
5. WIRING DIAGRAM 803485 (BASIC)
4. WIRE LIST 803486 (BASIC), 803580 (PARALLEL OUTPUTS), 803709 (VIDEO)

J7- VIDEO OUTPUT
J6- AC POWER INPUT
J5- VIDEO INPUT
J4- PARALLEL OUTPUTS (mS,S,M,H,D, TAPE SEARCH)
J3- PULSE RATES
J2- CODE OUTPUT } IRIG B
3. J1- CODE INPUT }

2. SLIDES & MOUNTING BRACKETS ARE OPTIONAL

(M) 16280-3 POWER SUPPLY
(J) 16635 123 PARALLEL OUTPUTS
(F) 17269 12 VIDEO INSERTER
(C) 16085 AGC
(B) 16082-1 IRIG ENCODER (B)
(A) 16543-13H BASIC
(AA) 16549-1 DISPLAY

NOTES: UNLESS OTHERWISE SPECIFIED

THIS DATA IS CONFIDENTIAL TO DATUM, INC AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT

TITLE: TIME CODE GENERATOR/TRANSLATOR

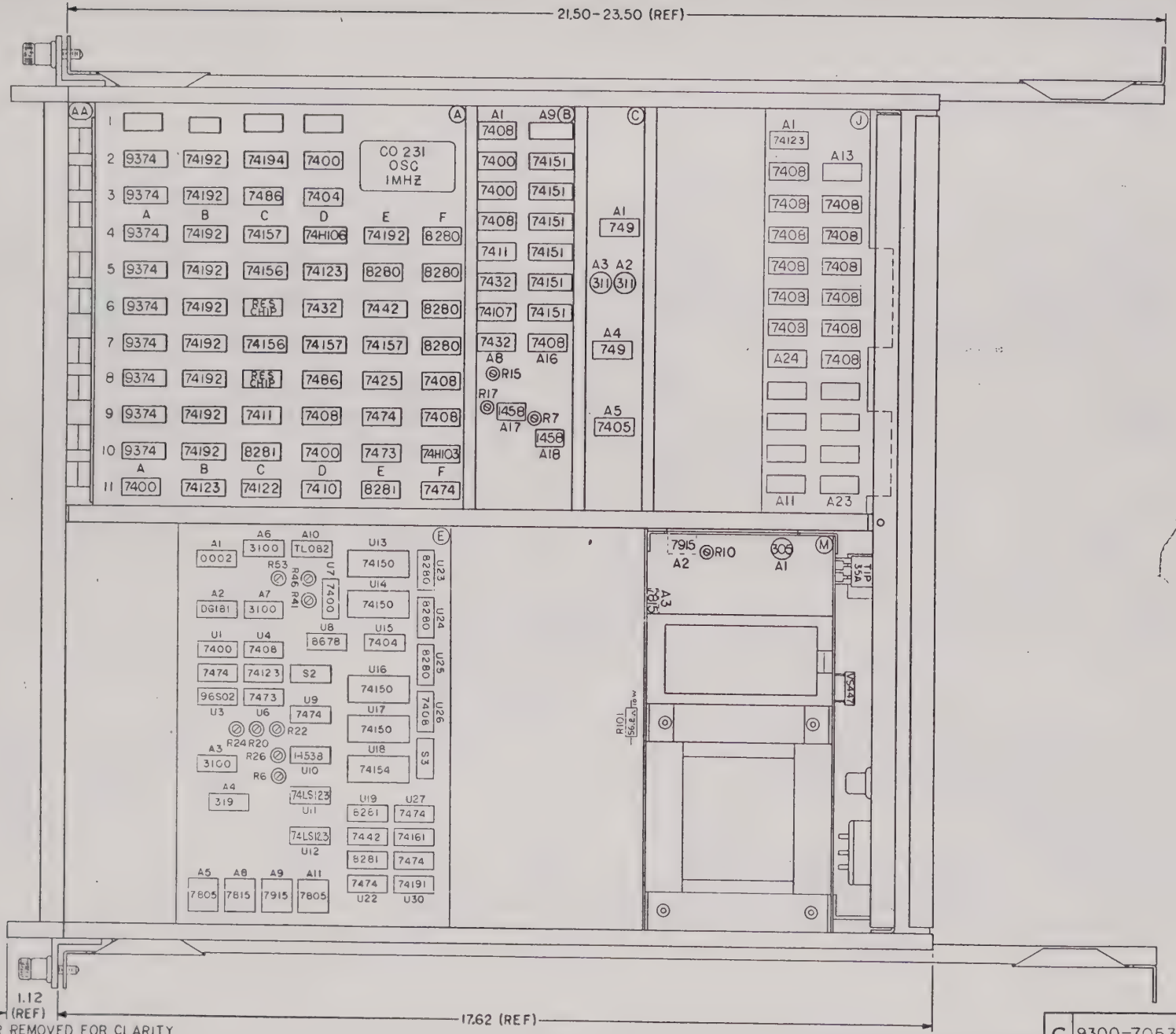
Datum Inc.
1363 S. STATE COLLEGE BLVD
ANAHEIM, CALIFORNIA 92806

DWN NEAL | CHK [illegible] | ENGR [illegible] | MFG

SCALE NONE | TOL 31160

C | 9300-7053 | A

SIZE | SHT 1 OF 2 | REV



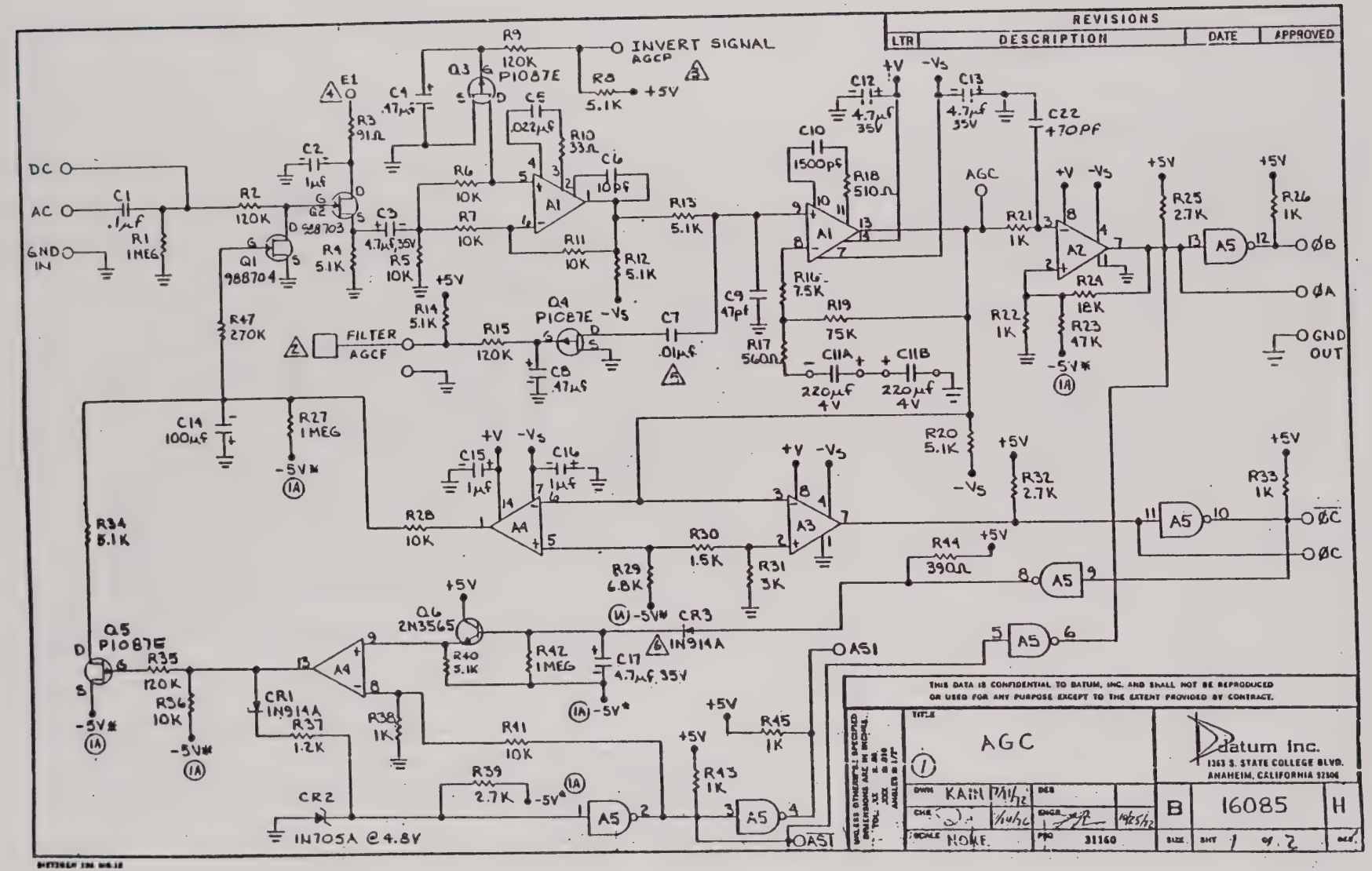
1. TOP COVER REMOVED FOR CLARITY

NOTES: UNLESS OTHERWISE SPECIFIED

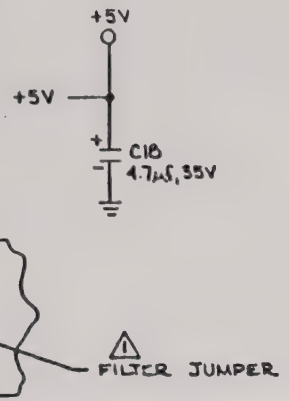
THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT.

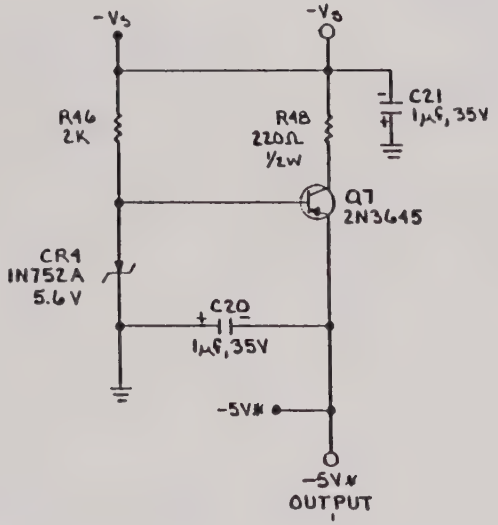
C	9300-7053	A
SIZE	SHT 2 OF 2	REV

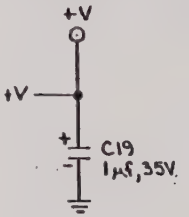
BISHOP GRAPHICS/ACCUPRESS REORDER NO. A 7804


REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
DC
AC
GND IN
C1 .1µf
R1 1MEG
R2 120K
Q1 988704
R3 91Ω
C2 1µf
C3 4.7µf,35V
R4 5.1K
R5 10K
+5V
R6 10K
R7 10K
Q3 P1087E
R9 120K
C4 .47µf
C5 .022µf
R10 33Ω
C6 10pf
A1
R11 10K
R12 5.1K
R13 5.1K
INVERT SIGNAL
AGCP
R8 5.1K +5V
E1
R14 5.1K
Q4 P1087E -Vs
C7 .01µf
R15 120K
C8 .47µf
FILTER
AGCF
R47 270K
C14 100µf
R27 1MEG
-5V*
(1A)
C10 1500pf
R18 510Ω
C12 4.7µf 35V
C13 4.7µf 35V
C22 470PF
+V
-Vs
AGC
R16 7.5K
R19 75K
C9 47pf
R17 560Ω
C11A 220µf 4V
C11B 220µf 4V
A2
R21 1K
R22 1K
R23 47K
R24 18K
R25 2.7K
R26 1K
A5
ØB
ØA
GND OUT
C15 1µf
C16 1µf
A4
A3
R28 10K
R30 1.5K
R29 6.8K
R31 3K
R20 5.1K
R32 2.7K
R33 1K
ØC
R34 5.1K
R44 390Ω
Q6 2N3565
CR3 IN914A
Q5 P1087E
R35 120K
R36 10K
R40 5.1K
R42 1MEG
C17 4.7µf 35V
CR1 IN914A
R37 1.2K
R38 1K
R41 10K
R45 1K
R43 1K
R39 2.7K
CR2 IN705A @4.8V
ASI
ASI
THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT.
TITLE
AGC
datum Inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806
DWN KAIN
DES
CHK
ENGR
SCALE NONE
PRO 31160
B
16085
H
SIZE
SHT 1 of 2

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	ADDED C22	5-27-72	R.F.
B	ADDED R20 TO SCHEMATIC +E WAS +V_S	1-22-73	[illegible]
C	Q3,4,5 WERE 2N4342	6-13-73	R.J.
D	ADDED C11A & C11B	7-13-73	[illegible]
E	Q1 WAS 988703	9-12-73	R.J./C.V
F	C12 & C13 WERE 1μf	9-21-73	[illegible]/C.V
G	R3 WAS TO +E, ADDED E1	11-26-73	[illegible]/R.S.
H	ADDED ⑥	7-7-79	C.A.







⑥ -2 C17 IS 27μF 10V, R27 IS 4.7M

⑤ -1 C7 IS .001 μF.

④ WIRE TO +15 OR +5V AS REQUIRED

③ THIS POINT GROUNDED TO INVERT SIGNAL - REVERSE MODE.

② SEE PARALLEL OUTPUT SCHEM FOR PIN NUMBER

① REMOVE FOR REMOTE OR HIGHSPEED OPERATION

SN7405	NATIONAL	A5
μA749	FAIRCHILD	A1, A4
LM311H	NATIONAL	A2, A3
PART NO	MFR	REF

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOL: .XX ±.02 .XXX ±.010 ANGLES ±.5°

TITLE: AGC (1A)

DWN KAIN 7/19/72 DES RF 7/19/72

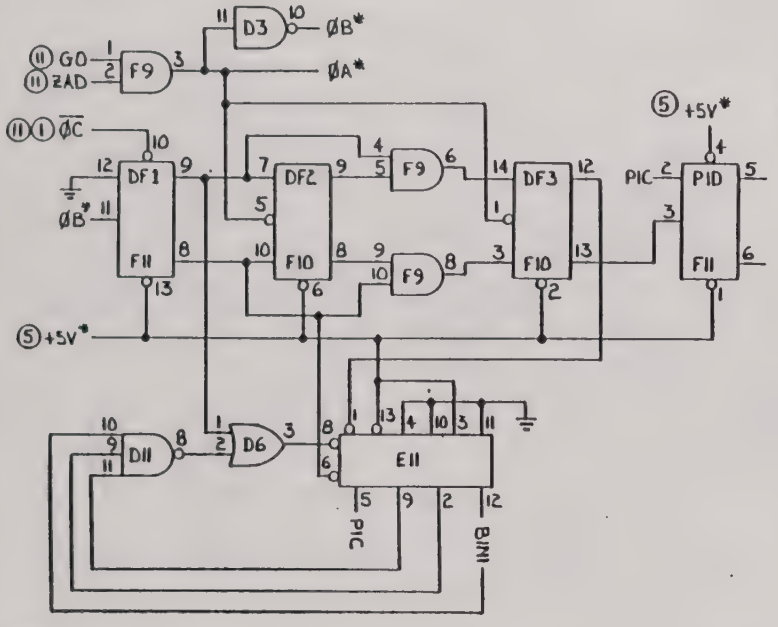
CHK [illegible] 7/19/72 ENGR [illegible] 4/25/73

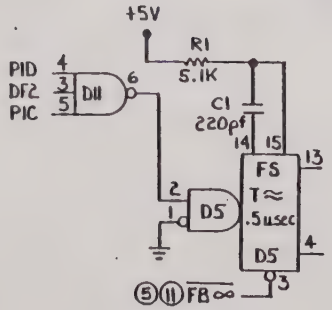
SCALE NONE FSC 31160

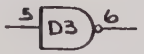
Datum Inc. 1363 S. STATE COLLEGE BLVD. ANAHEIM, CALIFORNIA 92806

SIZE B 16085 REV H

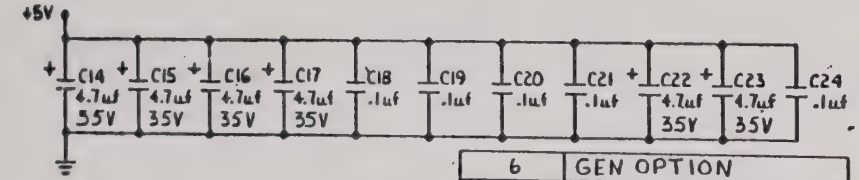
SHT 2 OF 2







NOT USED



DASH NO.	DESCRIPTION
6	GEN OPTION
5	10MHZ CRYSTAL OSC
4	CO251 OSC
3	CO231 OSC
2	EXT OSC
1	DAYS
—	BASIC S-M-H

NOTES: UNLESS OTHERWISE SPECIFIED

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED

PART NO	MFR	REF DES
899-1-R6K	BECKMAN	C6, C8
LM311D	NATIONAL	A1
MC12061P	MOTOROLA	D1
9374-DE	FAIRCHILD	A2-A10
SN74177N	T I	C10, E11
SN74176N	TI	E5, F4-F7, C1
N7486A	SIGNETICS	C3, D8
N7473A	↕	E10
N7442B	SIGNETICS	E6
SN7432N	T.I.	D6
N7411A	SIGNETICS	C9
N7410A	↕	D11
N7408A	↕	D9, F8, F9
N7404A	↕	D3
N7400A	SIGNETICS	D2, D10, A11
SN74156N	T.I.	C5, C7
SN7474N	↕	E9, F11
SN7425N	↕	E8
SN74194N	↕	C2
SN74192N	↕	B2-B10, E4
SN74157N	↕	C4, D7, E7
SN74123N	↕	D5, B11
SN74H106N	↕	D4
SN74H103N	T.I.	F10

PART NO	MFR	REF DES
SN74122N	TI	C11

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL .XX ±.03 .XXX ±.010 ANGLES ± 1/2°

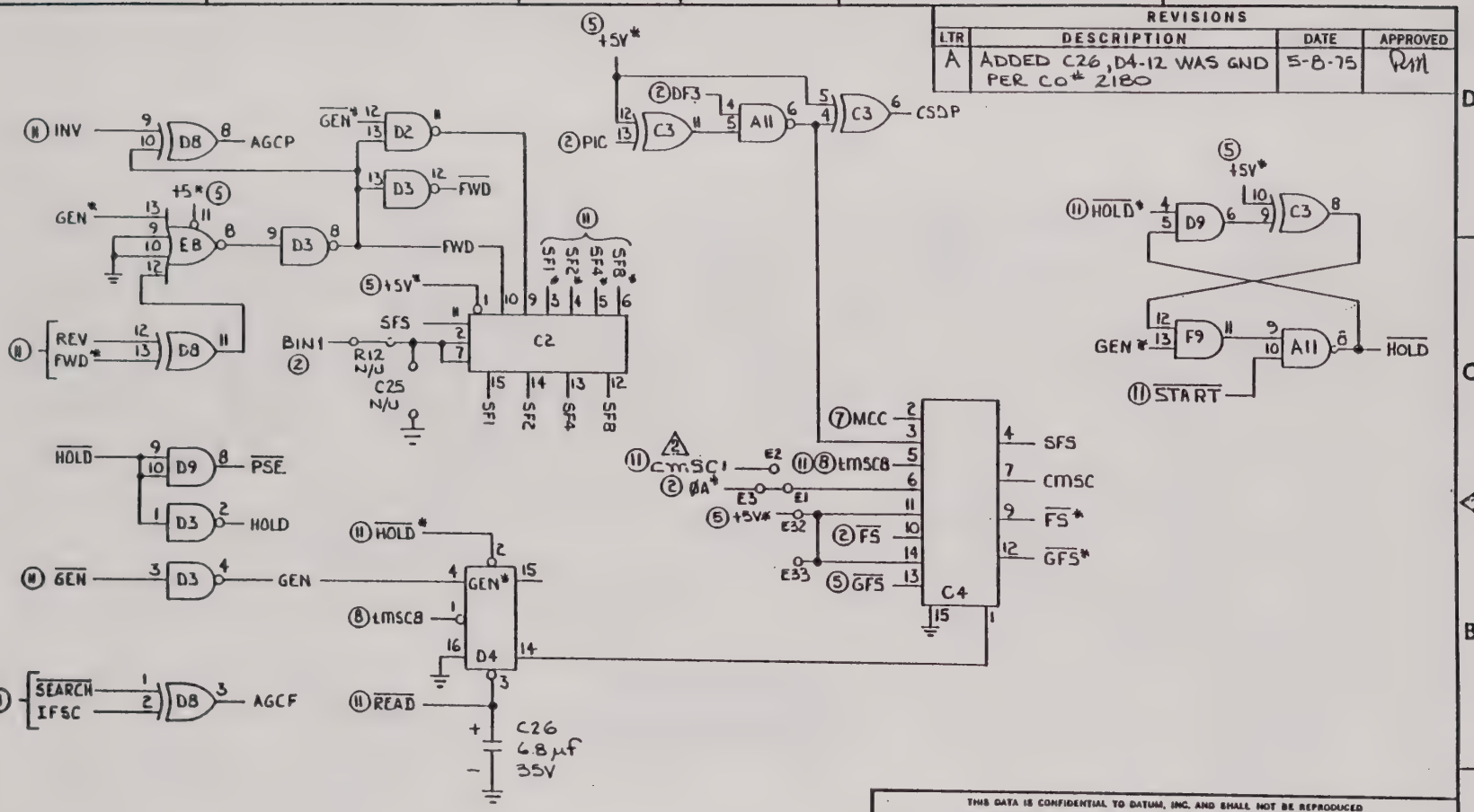
TITLE: IRIG BASIC (2) (DECODER)

DWN	IC	6/24/74	DES
CHK	RM	6/26/74	ENGR
SCALE	NONE	FSC	31160

datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

B | 16543 | E

SIZE | SHT 1 OF 8 | REV


REVISIONS
LTR | DESCRIPTION | DATE | APPROVED
A | ADDED C26, D4-12 WAS GND PER CO# 2180 | 5-8-75 | RJM
⑤ +5V*
② DF3
② PIC
C3
A11
C3
CSDP
⑪ INV
D8
AGCP
GEN*
D2
D3
FWD
GEN*
E8
D3
FWD
⑪ SF1* SF2* SF4* SF8*
⑤ +5V*
SFS
BIN1
②
R12 N/U
C25 N/U
C2
SF1 SF2 SF4 SF8
⑪ REV FWD*
D8
⑪ HOLD*
D9
C3
GEN*
F9
A11
HOLD
⑪ START
⑦ MCC
⑪ CMSC1
E2
⑪ ⑧ CMSC8
② ØA*
E3
E1
⑤ +5V*
E32
② FS
E33
⑤ GFS
C4
SFS
CMSC
FS*
GFS*
HOLD
D9
PSE
D3
HOLD
⑪ HOLD*
⑪ GEN
D3
GEN
GEN*
⑧ CMSC8
D4
⑪ READ
C26
6.8 µf
35V
⑪ SEARCH IFSC
D8
AGCF
⚠2 WITH SYNC GEN OPTION, REMOVE JUMPER BETWEEN E1 AND E3, JUMPER E1 TO E2.
NOTES: UNLESS OTHERWISE SPECIFIED
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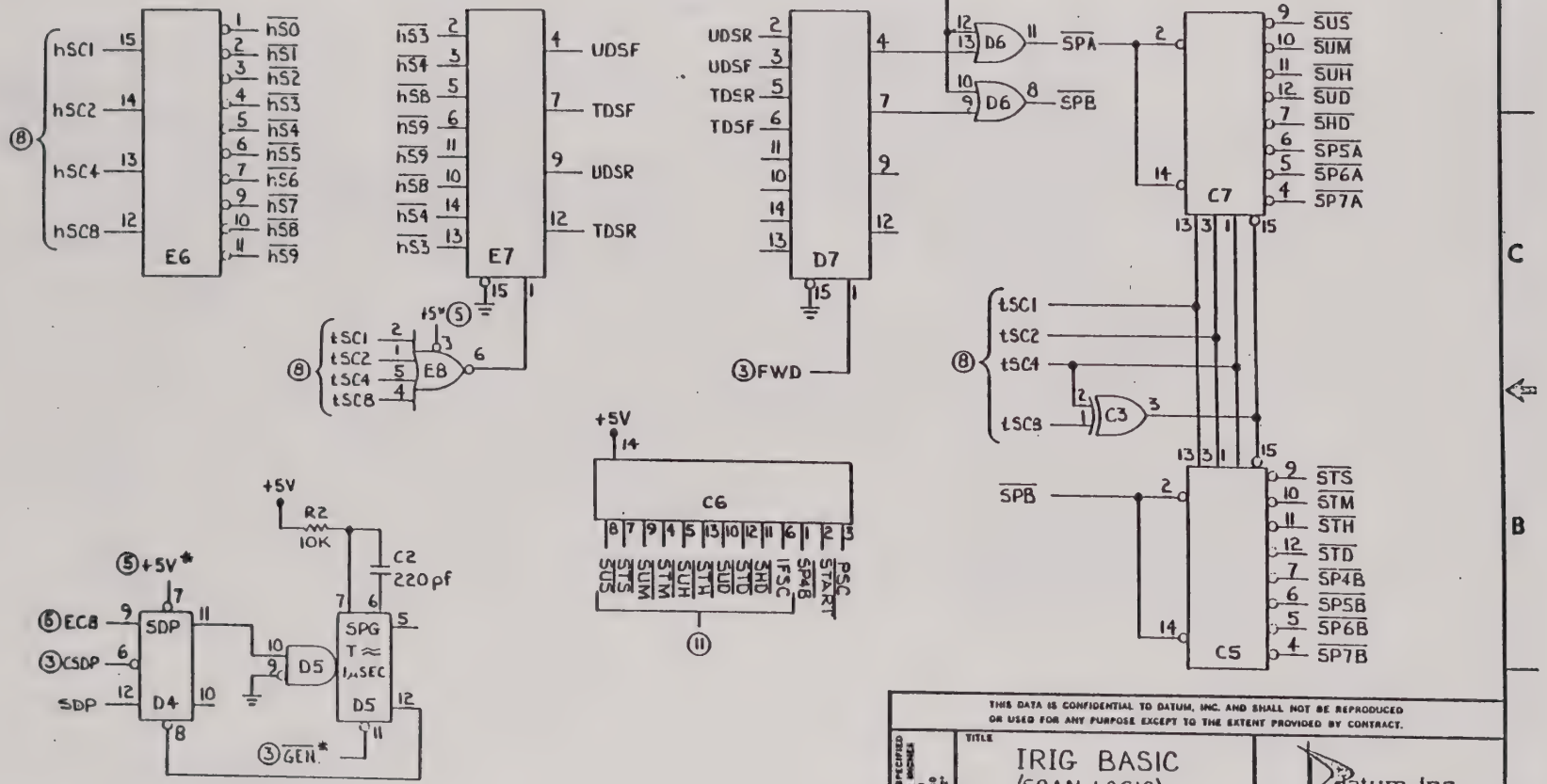
TITLE
IRIG BASIC
③ (MODE CONTROL)
datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806
DWN IC 6/24/74
CHK RJM 6/26/74
ENGR 12/16/74
SCALE NONE
FSC 31160
B 16543 E
SHT 2 OF 8



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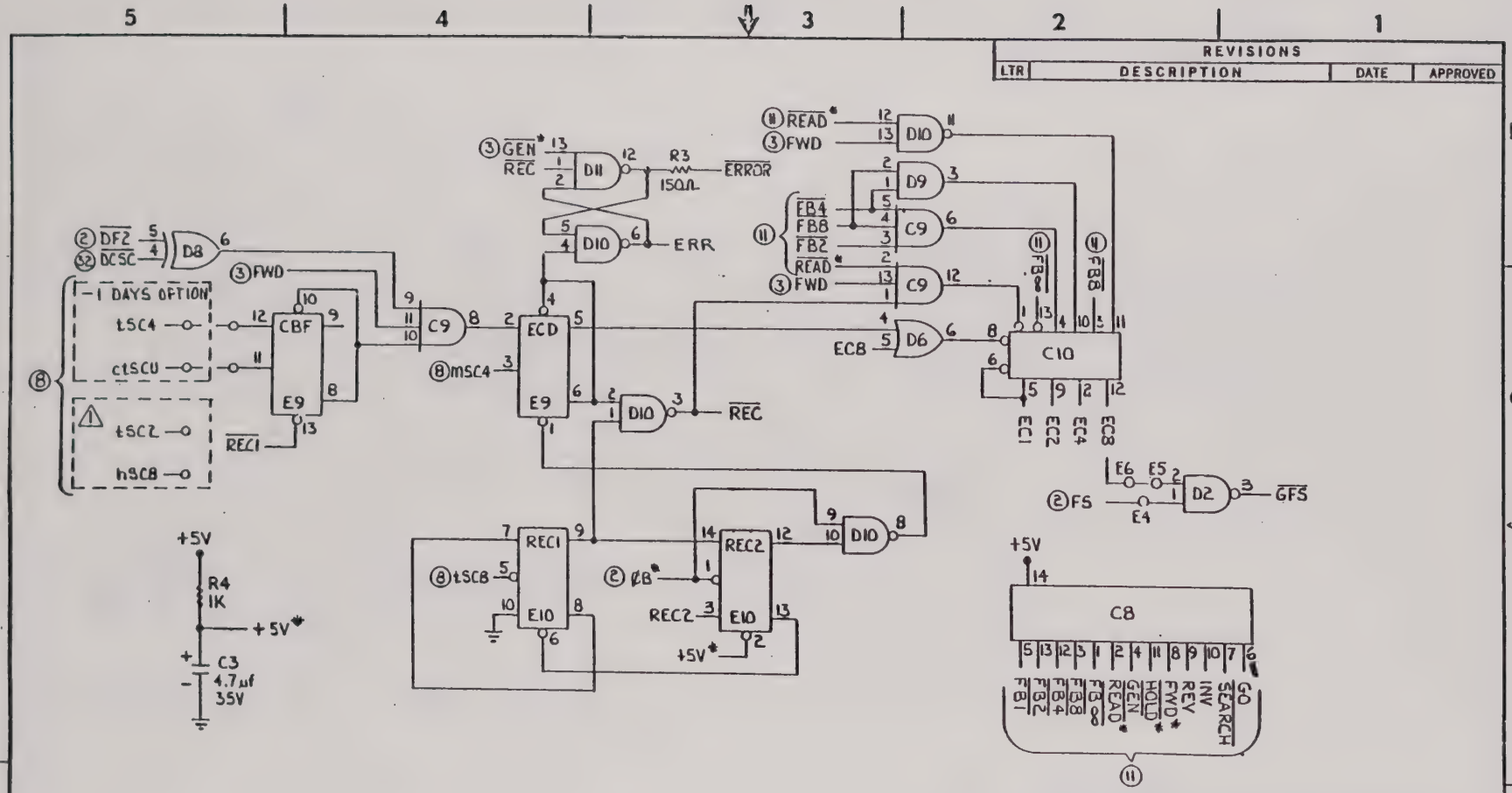
NOTES: UNLESS OTHERWISE SPECIFIED


REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
READ
FWD
GEN
REC
R3
1SΩ
ERROR
ERR
DF2
DCSC
D8
D11
D10
D9
C9
FB4
FB8
FB2
FB1
CBF
E9
ECD
MSC4
REC1
REC
EC8
D6
C10
EC1
EC2
EC4
EC8
E6
E5
E4
FS
D2
GFS
+5V
R4
1K
C3
4.7μf
35V
LSC8
REC2
E10
LB
C8
GO SEARCH
INV REV FWD
HOLD
GEN READ
FB8
FB4
FB2
FB1
IF DAYS OPTION IS NOT SUPPLIED:
E9-12 IS CONNECTED TO LSC2
E9-11 IS CONNECTED TO MSC8
NOTES: UNLESS OTHERWISE SPECIFIED
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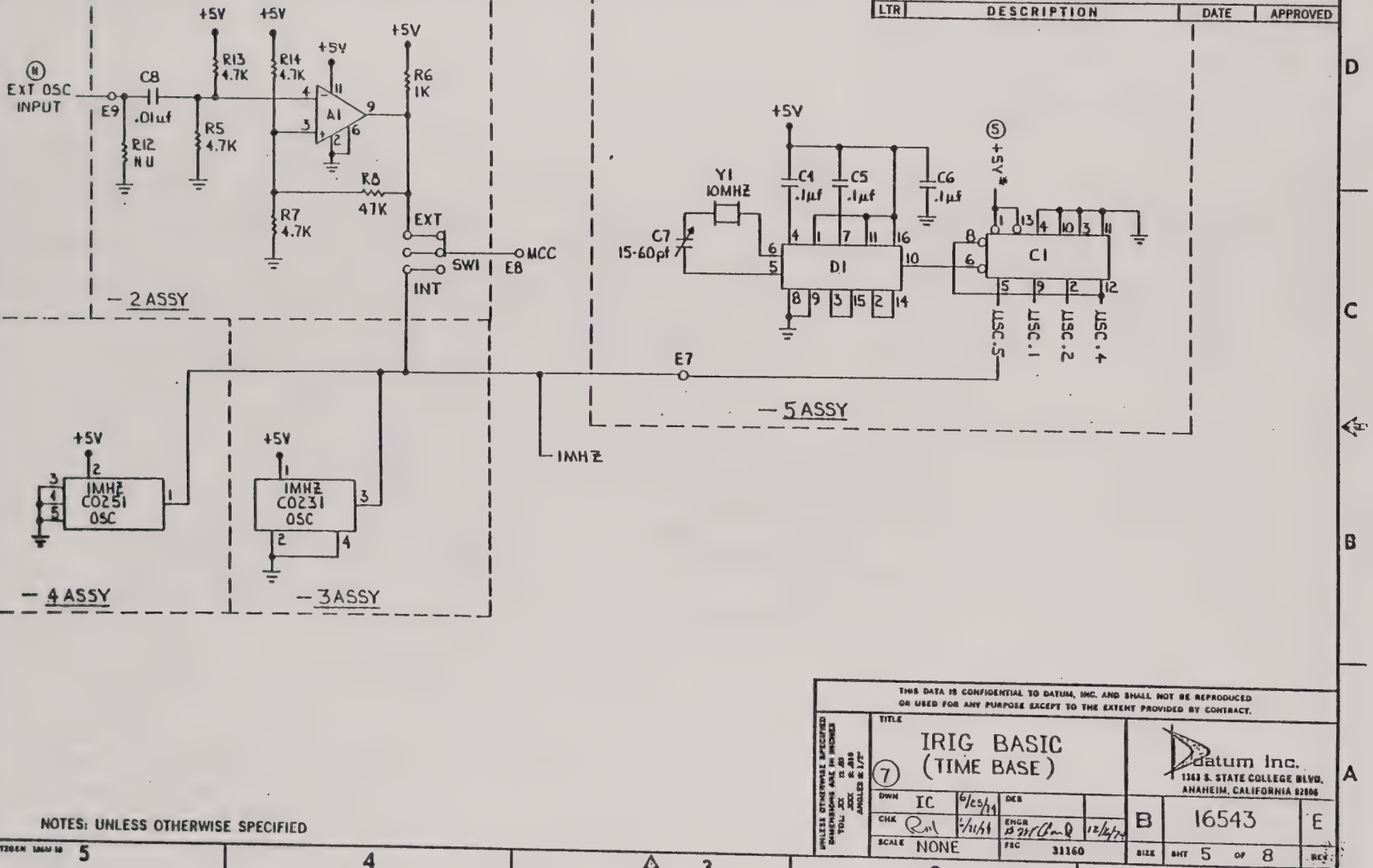
TITLE
IRIG BASIC
(SYNC MODE)
5
datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806
DWN IC 6/25/74
CHK 6/27/74
ENGR 12/4/74
SCALE NONE
FSC 31160
B
16543
E
SHT 4 OF 8



REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL .XX ±.03 .XXX ±.010 ANGLES ± 1/2°

TITLE: IRIG BASIC (TIME BASE) (7)

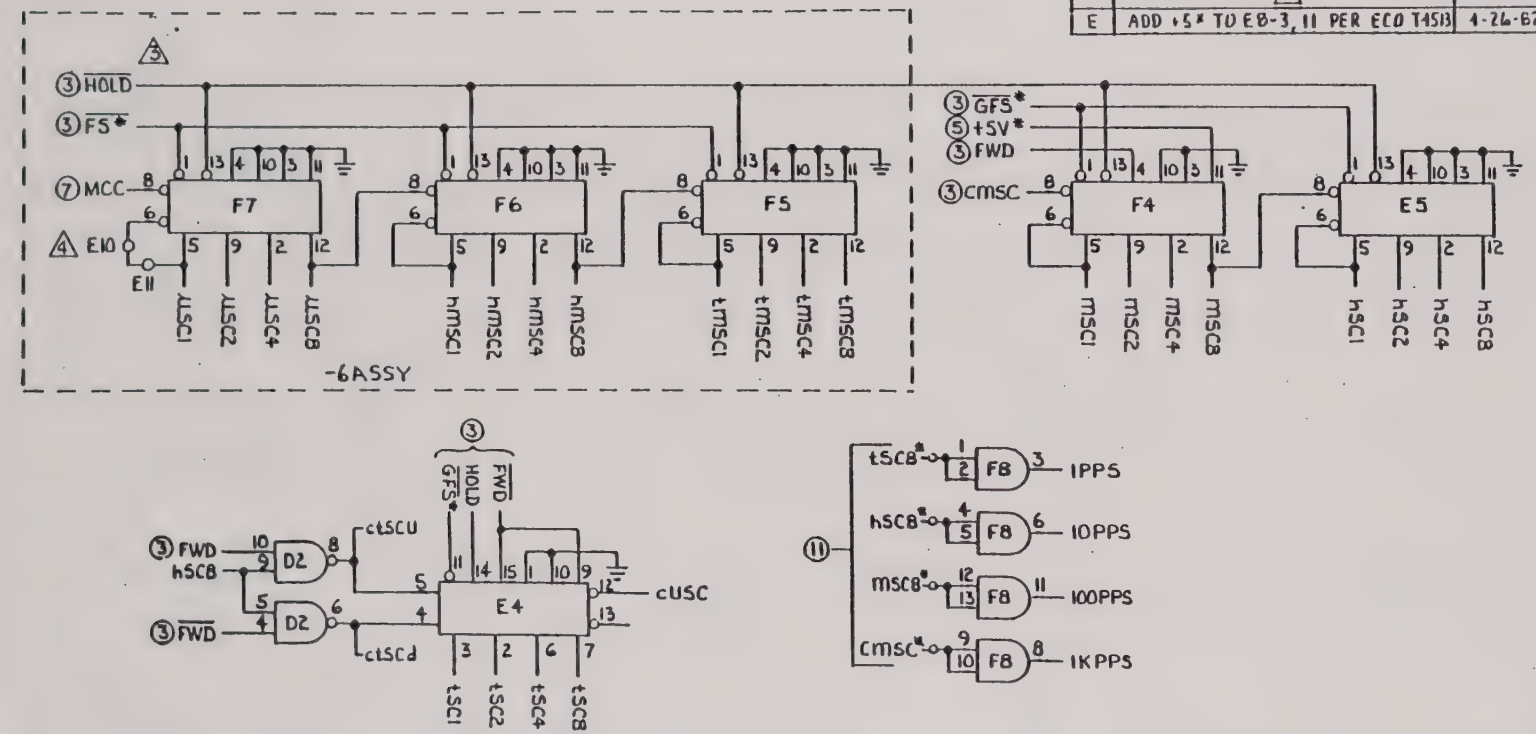
DWN	IC	6/23/71	DES
CHK	Rnl	7/11/71	ENGR B.J.H. Cmp
SCALE	NONE		FSC 31160

datum Inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

B | 16543 | E

SIZE | SHT 5 OF 8 | REV

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
B	C11 WAS 74123 PER CO#2277	9-9-75	Pil
C	REVISED PER C.O. 2747	6-18-76	IC
D	ADDED NOTE (4)	12-10-81	T.L.
E	ADD +5* TO E8-3, 11 PER ECO T4513	4-26-82	DR



(4) WHEN ADV/RET OPTION IS USED CONNECTION BETWEEN E10 & E11 IS REMOVED. E10 IS CONNECTED TO CHSC2 FROM (20)

(5) WHEN SYNC GEN OPTION IS USED ALL -6 TERMS ORIGINATE ON (15)

NOTES: UNLESS OTHERWISE SPECIFIED

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL: .XX ±.02 .XXX ±.010 ANGLES ±1/2°

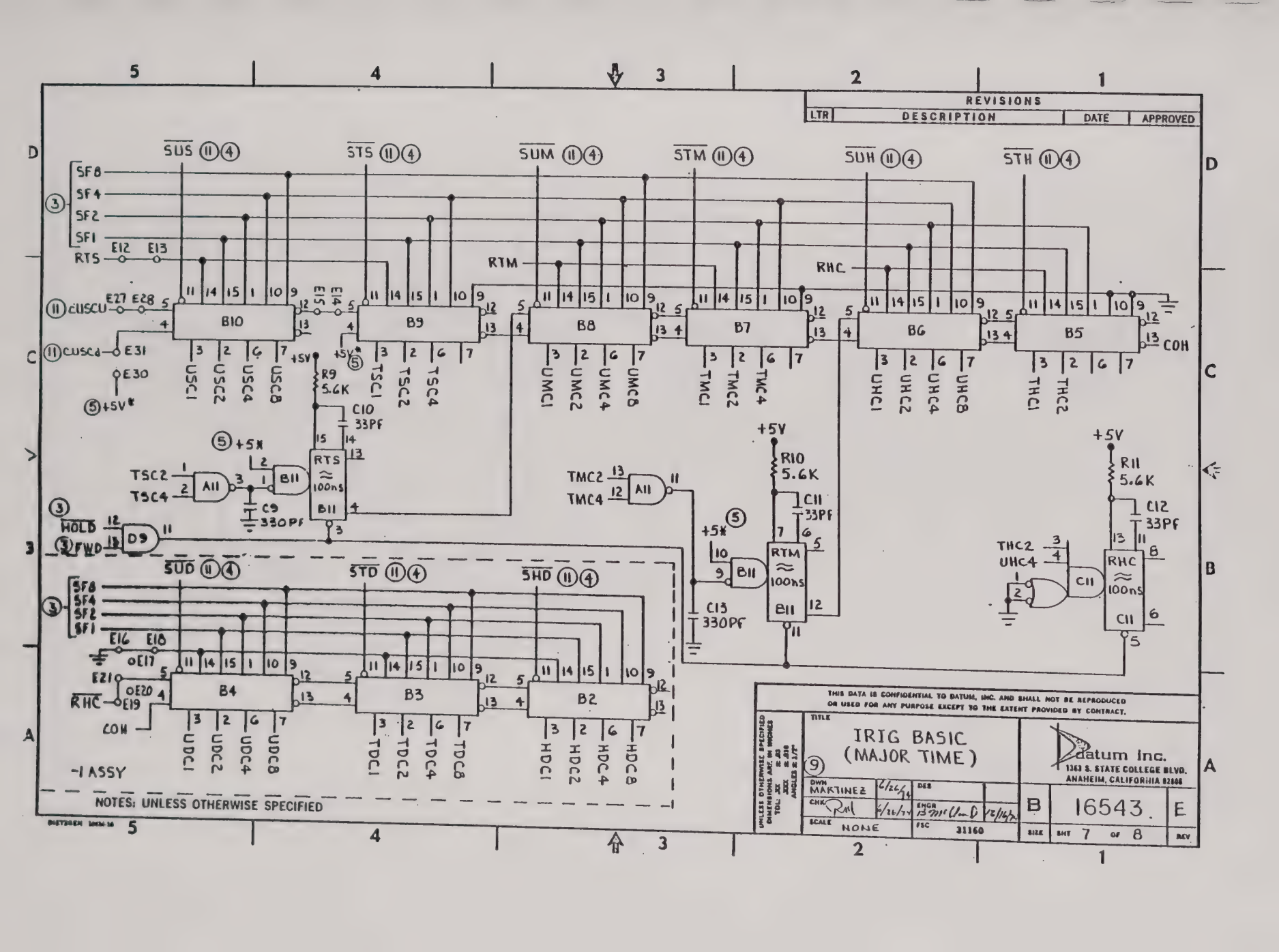
TITLE: IRIG BASIC (8) (MINOR TIME)

DWN	IC	6/25/74	DES	
CHK		6/26/74	ENGR	12/16/74
SCALE	NONE		FSC	31160

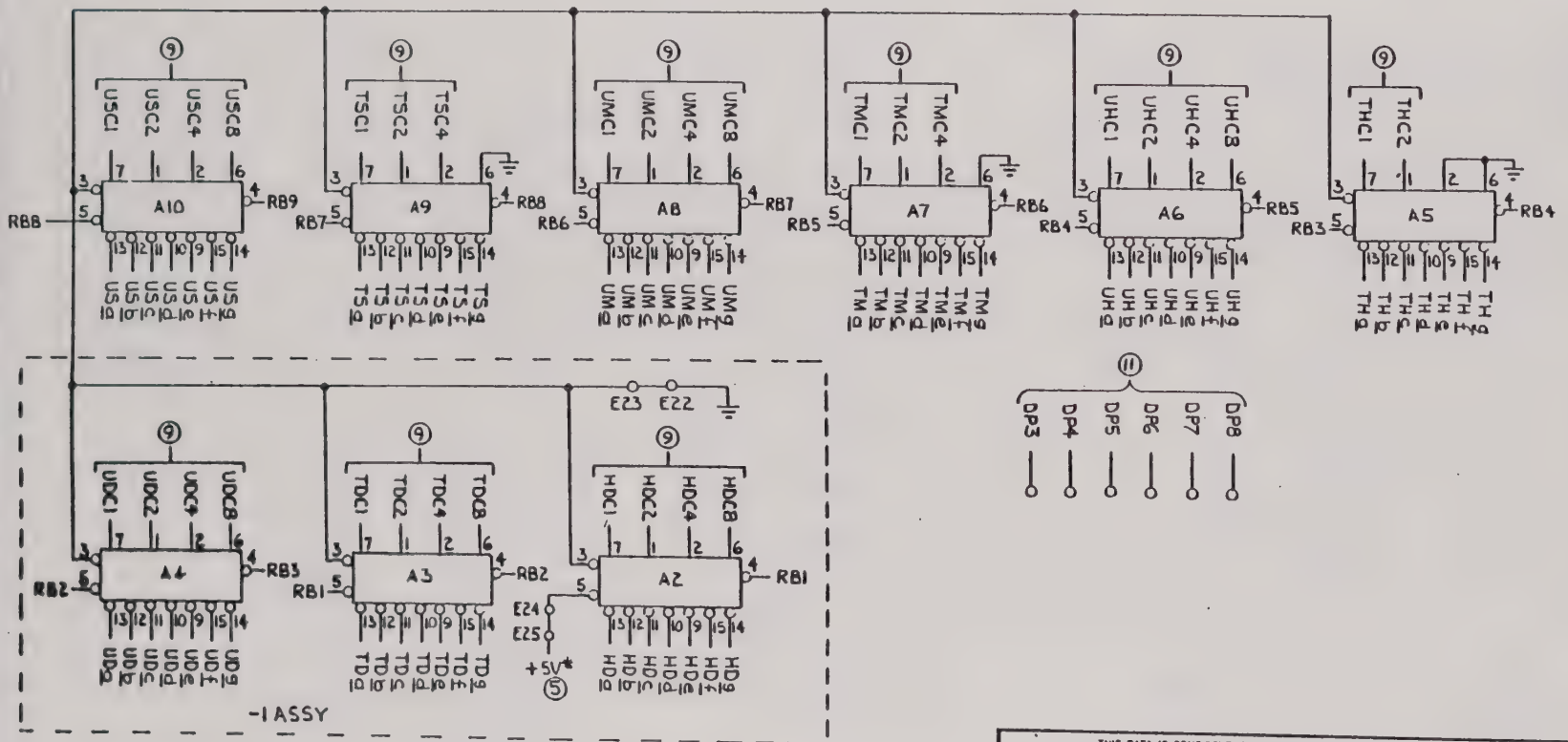
Datum Inc. 1363 S. STATE COLLEGE BLVD. ANAHEIM, CALIFORNIA 92806

B | 16543 | E

SIZE | SHT 6 OF 8 | REV


REVISIONS
LTR DESCRIPTION DATE APPROVED
SUS ⑪④
STS ⑪④
SUM ⑪④
STM ⑪④
SUH ⑪④
STH ⑪④
SF8
SF4
SF2
SF1
RTS
E12 E13
RTM
RHC
⑪CUSCU
E27 E28
⑪CUSC4
E31
E30
⑤+5V*
B10
B9
B8
B7
B6
B5
USC1 USC2 USC4 USC8
TSC1 TSC2 TSC4
UMC1 UMC2 UMC4 UMC8
TMC1 TMC2 TMC4
UHC1 UHC2 UHC4 UHC8
THC1 THC2
COH
R9 5.6K
C10 33PF
RTS ≈ 100nS
TSC2
TSC4
A11
B11
C9 330PF
HOLD
③FWD
D9
TMC2
TMC4
R10 5.6K
C11 33PF
RTM ≈ 100nS
C13 330PF
R11 5.6K
C12 33PF
THC2
UHC4
C11
RHC ≈ 100nS
SUD ⑪④
STD ⑪④
SHD ⑪④
E16 E18
E17
E21
E20
E19
RHC
COH
B4
B3
B2
UDC1 UDC2 UDC4 UDC8
TDC1 TDC2 TDC4 TDC8
HDC1 HDC2 HDC4 HDC8
-1 ASSY
NOTES: UNLESS OTHERWISE SPECIFIED
THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT.
TITLE
IRIG BASIC (MAJOR TIME)
⑨
DWN MARTINEZ 6/26/74
CHK RML 6/26/74
ENGR 12/14/74
SCALE NONE
FSC 31160
datum inc.
1363 S. STATE COLLEGE BLVD. ANAHEIM, CALIFORNIA 92806
B 16543. E
SIZE SHT 7 OF 8 REV

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

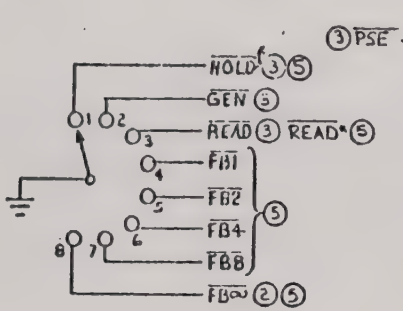


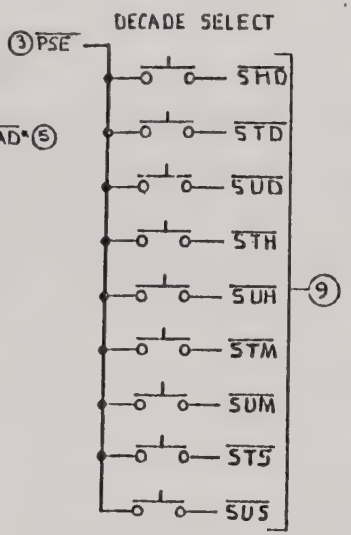
NOTES: UNLESS OTHERWISE SPECIFIED

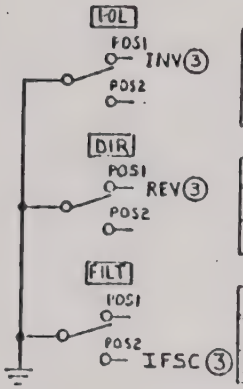
THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT.

TITLE	IRIG BASIC (10) (DISPLAY DRIVERS)	datum inc. 1363 S. STATE COLLEGE BLVD. ANAHEIM, CALIFORNIA 92806	
DWN IC 6/25/74	DES	B	16543 E
CHK [illegible] 6/26/74	ENGR [illegible] 6/26/74		
SCALE NONE	FSC 31160	SIZE	SHT 8 OF 8 REV

POS.	MODE SW
1	HOLD
2	GEN
3	READ
4	FB1
5	FB2
6	FB4
7	FB8
8	FB∞



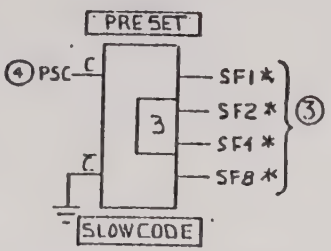




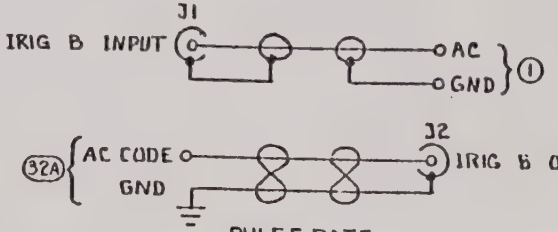
POL SW	
POS 1	+
POS 2	−

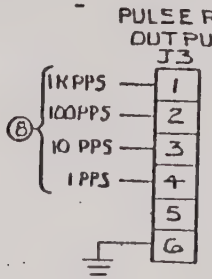
DIRECTION SW	
POS 1	FWD
POS 2	REV

FILTER SW	
POS 1	IN
POS 2	OUT



⑤ REC —— REC ㉝
⑳ GO —— GO ②
㉜ FWD* —— FWD* ③
㉚ SEARCH —— SEARCH ③
⑧ tSC8 —— cSTPI ㉚
① ØA —— ZAD ②





⑧ cusc E27 —— E28 cuscu ⑨
⑤ +5* E30 —— E31 cuscd ⑨

⑧ tSC8 —— tSC8* ⑧
hSC8 —— hSC8*
mSC8 —— mSC8*
③ cmsc —— cmsc*

TERMS ⑪ REFERENCED TO THIS PRINT AND NOT SHOWN ARE FOR INTERNAL REFERENCE ONLY
NOTES: UNLESS OTHERWISE SPECIFIED

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT.

TITLE
SWITCH & CONTROL LOGIC
⑪ (9300-709)

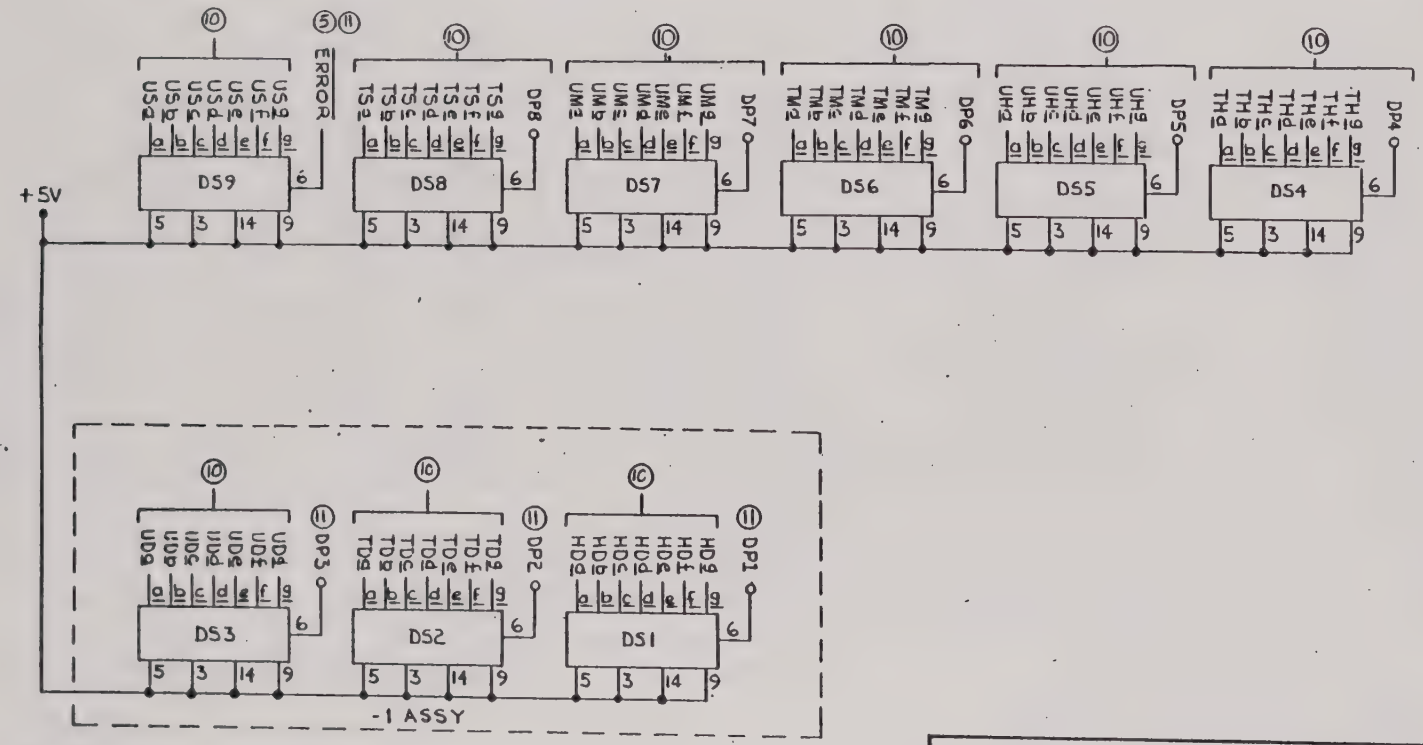
Datum Inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

DRN	KAIN 12/05	ECO	
CHK			
SCALE		DATE	

B 9300-8111

SHT 1 OF 1

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
–	ADDED -4, -5, -6	10-21-71	CC/



-5 LEDS ARE YELLOW, H/P 5082-7660
-4 LEDS ARE GREEN, H/P 5082-7670
-3 LEDS ARE FAIRCHILD FND-507
-2 LEDS ARE MONSANTO MANGA
1. LEDS H/P 5082-7650

6 LEDS ARE MONSANTO, 6660

NOTES: UNLESS OTHERWISE SPECIFIED

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOL .XX ±.03
.XXX ±.010
ANGLES ±1/2°

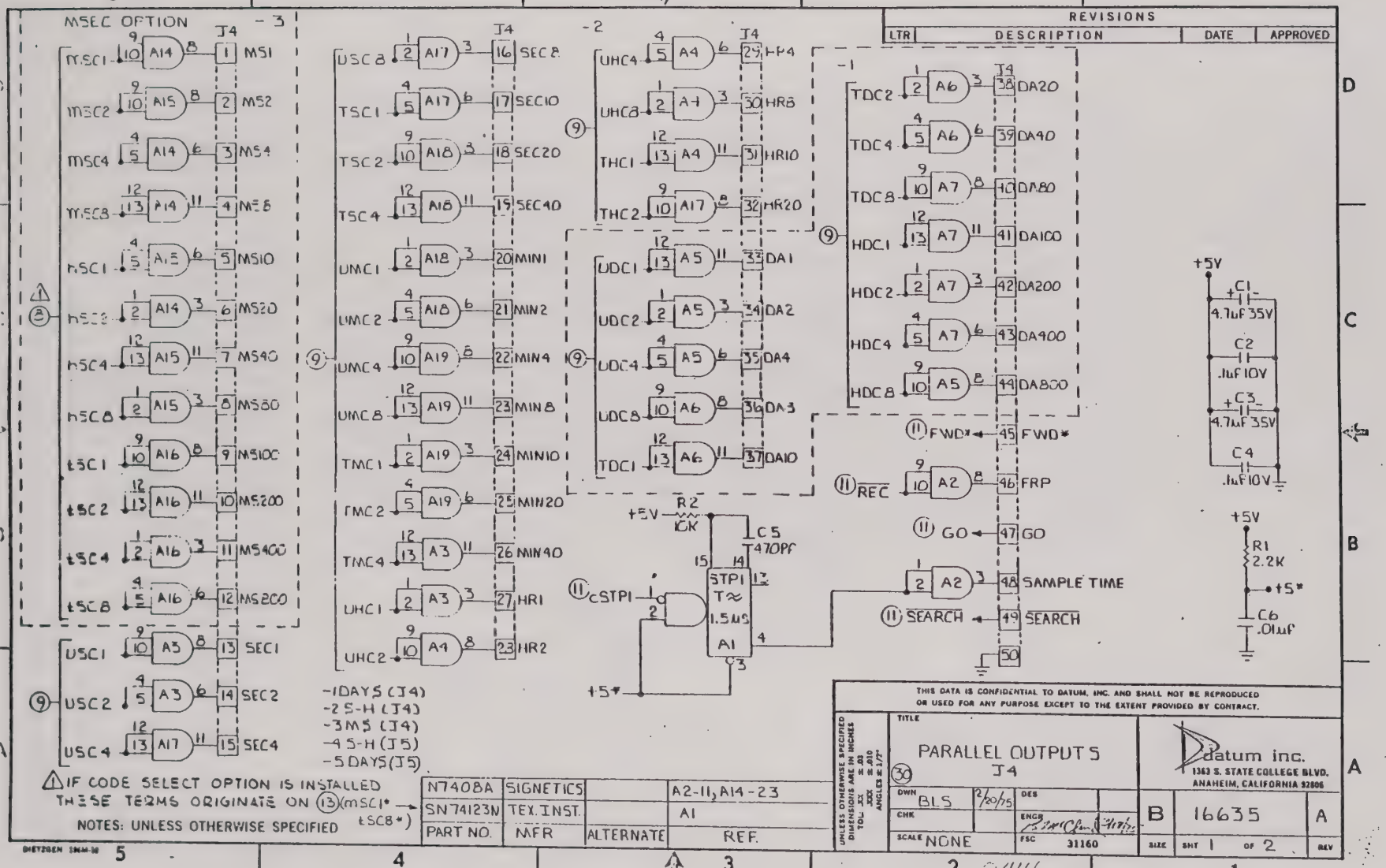
TITLE: LED DISPLAY (12)

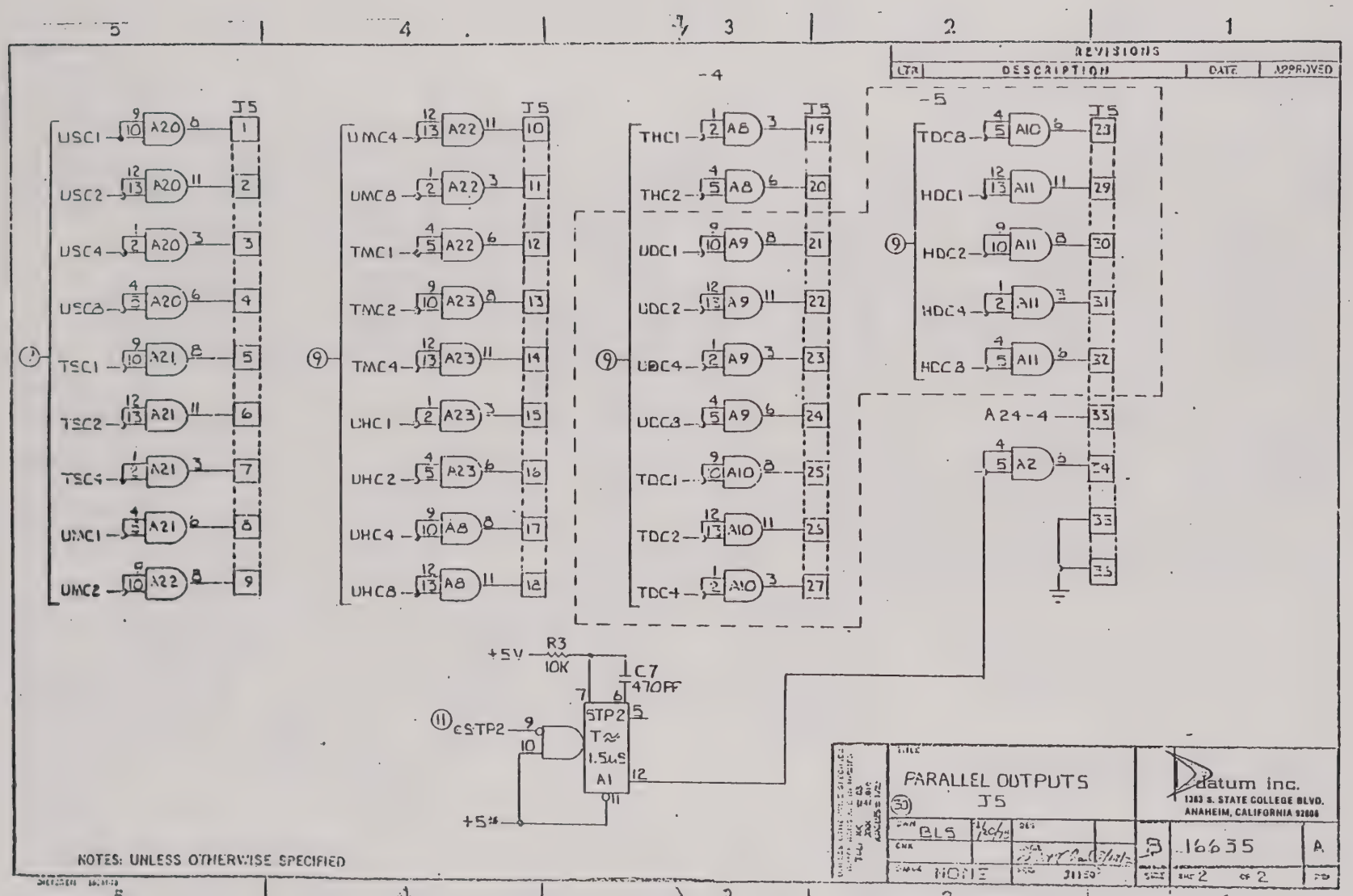
datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

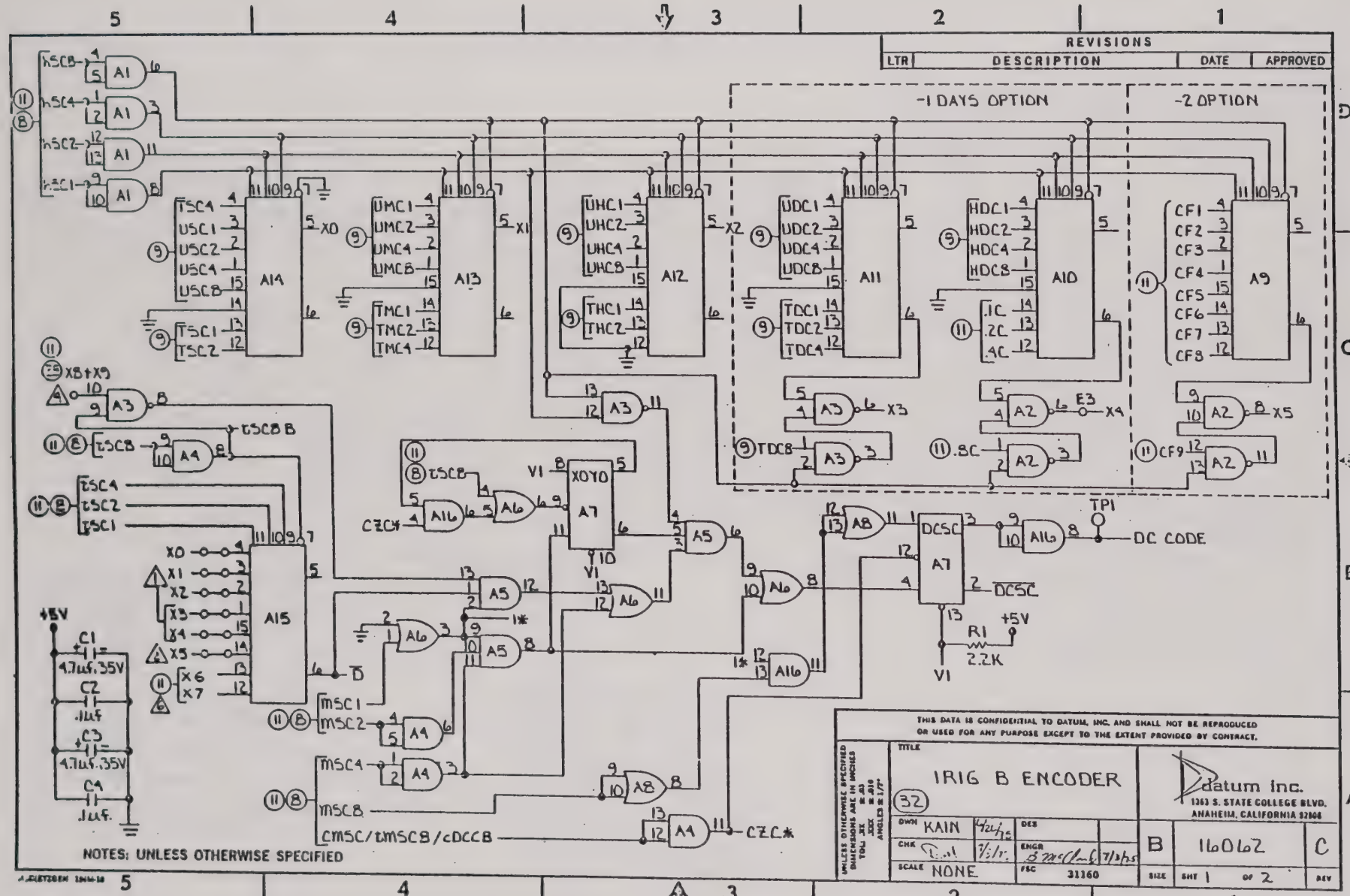
DWN	IC	6/26/74	DES		
CHK		7/22/71	ENGR	B McClain	11/4/71
SCALE	NONE		FSC	31160	

B 16549

SIZE | SHT 1 OF 1 | REV


MSEC OPTION -3
J4
MSC1
MSC2
MSC4
MSC8
HSC1
HSC2
HSC4
HSC8
TSC1
TSC2
TSC4
TSC8
USC1
USC2
USC4
MS1
MS2
MS4
MS8
MS10
MS20
MS40
MS80
MS100
MS200
MS400
MS800
SEC1
SEC2
SEC4
-2
UHC4
UHC8
THC1
THC2
HR4
HR8
HR10
HR20
UDC1
UDC2
UDC4
UDC8
TDC1
DA1
DA2
DA4
DA8
DA10
-1
TDC2
TDC4
TDC8
HDC1
HDC2
HDC4
HDC8
DA20
DA40
DA80
DA100
DA200
DA400
DA800
USC8
TSC1
TSC2
TSC4
UMC1
UMC2
UMC4
UMC8
TMC1
TMC2
TMC4
UHC1
UHC2
SEC8
SEC10
SEC20
SEC40
MIN1
MIN2
MIN4
MIN8
MIN10
MIN20
MIN40
HR1
HR2
-1 DAYS (J4)
-2 S-H (J4)
-3 MS (J4)
-4 S-H (J5)
-5 DAYS (J5)
FWD*
REC
GO
SEARCH
FWD*
FRP
GO
SAMPLE TIME
SEARCH
cSTPI
STPI
T≈ 1.5μs
R2 10K
C5 470PF
+5V
C1 4.7μF 35V
C2 .1μF 10V
C3 4.7μF 35V
C4 .1μF 10V
R1 2.2K
C6 .01μF
+5*
IF CODE SELECT OPTION IS INSTALLED THESE TERMS ORIGINATE ON (13) (mSC1* → tSC8*)
NOTES: UNLESS OTHERWISE SPECIFIED
N7408A SIGNETICS A2-11, A14-23
SN74123N TEX. INST. A1
PART NO. MFR ALTERNATE REF.
THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT.
TITLE
PARALLEL OUTPUTS
(39) J4
DWN BLS 2/20/75
CHK
SCALE NONE
FSC 31160
datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806
B 16635 A
SIZE SHT 1 OF 2 REV
REVISIONS
LTR DESCRIPTION DATE APPROVED


REVISIONS
LTR DESCRIPTION DATE APPROVED
-4
-5
J5
USC1
USC2
USC4
USC8
TSC1
TSC2
TSC4
UMC1
UMC2
UMC4
UMC8
TMC1
TMC2
TMC4
UHC1
UHC2
UHC4
UHC8
THC1
THC2
UDC1
UDC2
UDC4
UCC8
TDC1
TDC2
TDC4
TDC8
HDC1
HDC2
HDC4
HCC8
A24-4
+5V
R3
10K
C7
470PF
STP2
T≈
1.5uS
A1
CSTP2
+5V
NOTES: UNLESS OTHERWISE SPECIFIED
PARALLEL OUTPUTS
J5
datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806
DRN BLS
CHK
ENGR NONE
SIZE B
16635
A
SHT 2 OF 2


REVISIONS
LTR | DESCRIPTION | DATE | APPROVED
-1 DAYS OPTION
-2 OPTION
TSCB
TSC4
TSC2
TSC1
A1
A14
A13
A12
A11
A10
A9
A3
A4
A2
A16
A6
A7
A5
A8
A15
A17
XO
X1
X2
X3
X4
X5
X6
X7
X8+X9
TSCB B
V1
CZC*
1*
TPI
DC CODE
DCSC
R1
2.2K
+5V
C1
4.7uf.35V
C2
.1uf
C3
4.7uf.35V
C4
.1uf.
mSC1
mSC2
mSC4
mSCB
cmSC/tmSCB/cDCCB
NOTES: UNLESS OTHERWISE SPECIFIED
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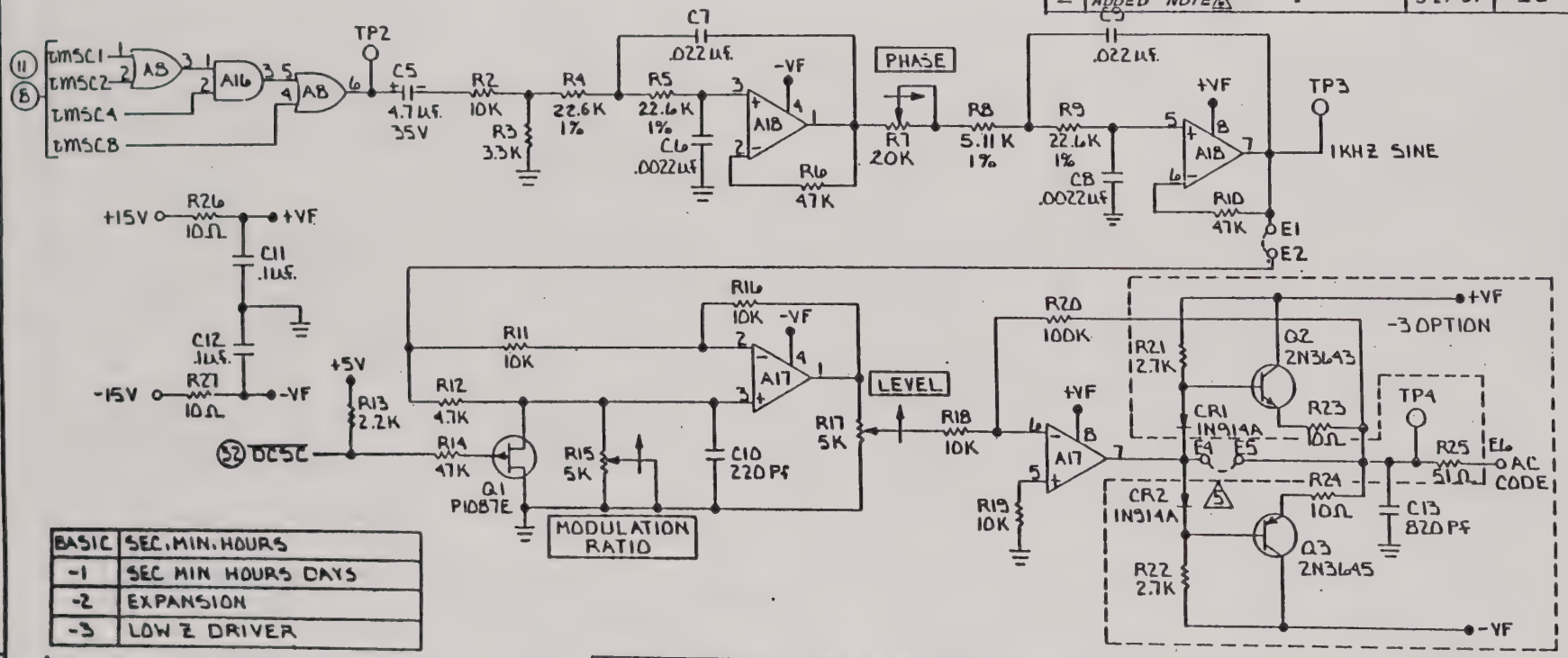
TITLE
IRIG B ENCODER
32
DWN KAIN
CHK
SCALE NONE
DES
ENGR
FSC 31360
datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806
B
160062
C
SIZE
SHT 1 OF 2
REV

IC A7 WAS 74107 PER ECO T-EE2	6-15-84	JC

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	R4 WAS 20.5K PER CO# 27-9	2-3-77	.KM
—	ADDED (11) REF.'S CF1-CF9 W-2	11-14-77	CC/KM
B	REVISED PER C.O.#T3755	5-31-79	LS/SR
—	ADDED NOTE 6	3-27-81	JC



BASIC	SEC. MIN. HOURS
-1	SEC MIN HOURS DAYS
-2	EXPANSION
-3	LOW Z DRIVER

6 GND WHEN C/F SCAN NOT USED

5 REMOVE JUMPER FROM E4-E5 WHEN -3 OPTION IS USED.

4 GROUND WHEN 17 BIT BINARY NOT USED.

3 GROUND PIN14 WHEN -2 OPTION IS NOT USED.

1 CUT ETCH AND GROUND PINS 1 & 15 WHEN DAYS OPTION IS NOT USED.

NOTES: UNLESS OTHERWISE SPECIFIED

PART NO.	MFR	REF. DES.
N5558V	SIGNETICS	A17, A18
N74151N	T.I.	A9-15
SN74LS107N	TI	A7
N7432A	NATIONAL	A6, 8
N7411A	↓	A5
N7408A	↓	A1, A9, A16
N7400A	NATIONAL	A2, A3

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
XX ± .03
XXX ± .010
ANGLES ± 1/2°

TITLE: IRIG B ENCODER (32A)

DWN	KAIN	6/26/75	DES
CHK	RM	7/3/75	ENGR
SCALE	NONE		FSC 81160

Datum Inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

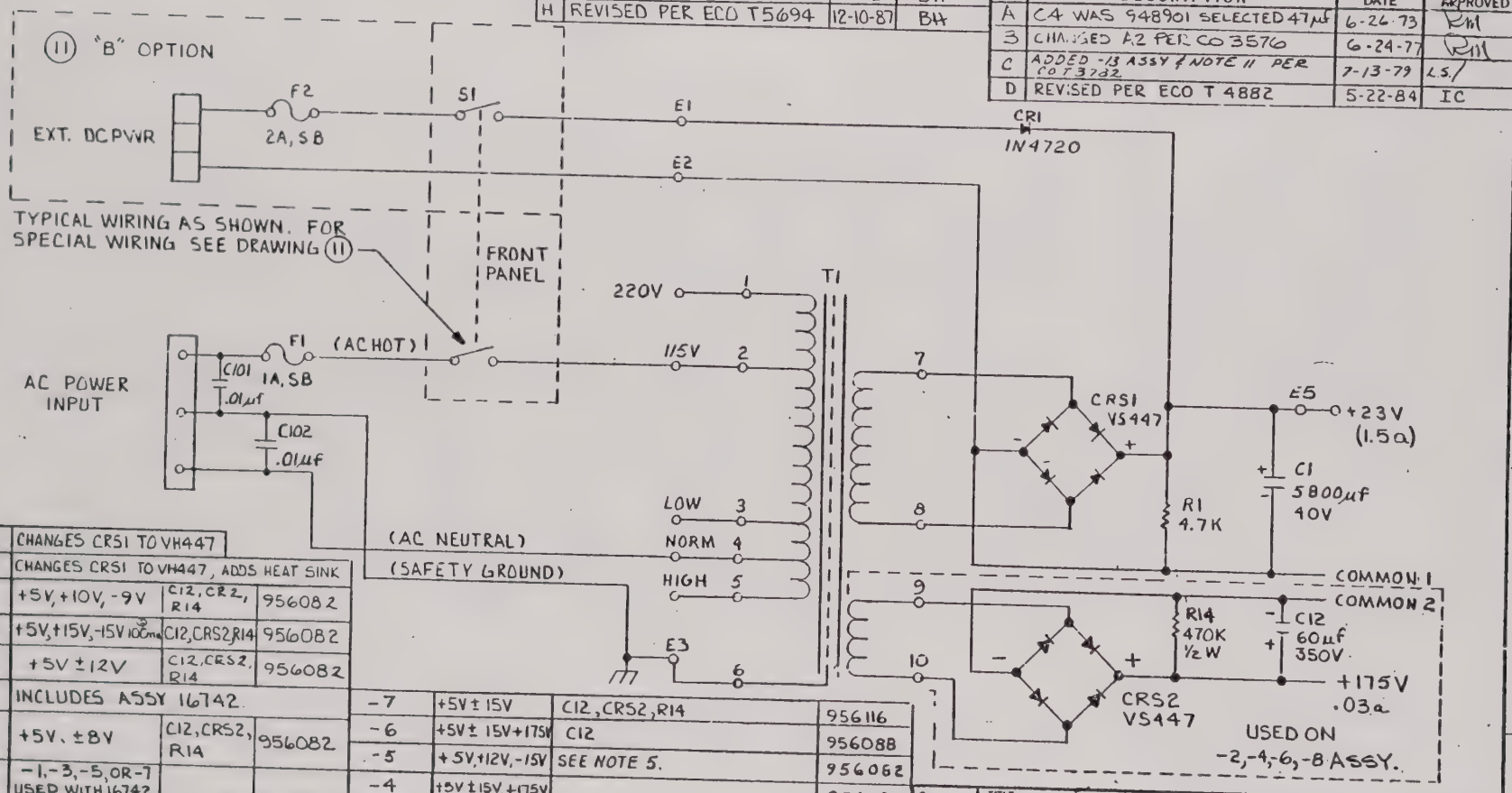
B | 16062 | C

SIZE | SHT 2 OF 2 | REV

E	REVISED PER ECO T5126	10.3.85	SATINDER
F	REVISED PER ECO T5498	4-8-87	BH
H	REVISED PER ECO T5694	12-10-87	BH

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
A	C4 WAS 948901 SELECTED 47μf	6-26-73	RM
B	CHANGED A2 PER CO 3576	6-24-77	RM
C	ADDED -13 ASSY & NOTE 11 PER CO T3782	7-13-79	L.S.
D	REVISED PER ECO T 4882	5-22-84	IC



DASH NO		COMP. NOT USED	XFORMER USED
-C	CHANGES CRS1 TO VH447		
-H	CHANGES CRS1 TO VH447, ADDS HEAT SINK		
-13	+5V, +10V, -9V	C12, CR2, R14	956082
-12	+5V, +15V, -15V 100ma	C12, CRS2, R14	956082
-11	+5V ±12V	C12, CRS2, R14	956082
A	INCLUDES ASSY 16742		
-10	+5V, ±8V	C12, CRS2, R14	956082
-9	-1, -3, -5, OR -7 USED WITH 16742		
-8	+5V, +12, -15, +175	C12	956088

DASH NO.		COMP'S NOT USED	XFORMER USED
-7	+5V ± 15V	C12, CRS2, R14	956116
-6	+5V ± 15V +175V	C12	956088
-5	+5V, +12V, -15V	SEE NOTE 5.	956062
-4	+5V, ±15V, +175V		956088
-3	+5V, ±15V	C12, CRS2, R14	956082
-2	+5V, +175V	A2, A3, C8, C9, C10, C11, CR7, CR8	956088
-1	+5 ONLY	A2, A3, C8, C9, C10, C11, C12, CR7, CRS2, R14, CR8	956062

NOTES: UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOL. .XX ±.02 .XXX ±.010
ANGLES ±1°

TITLE: POWER SUPPLY

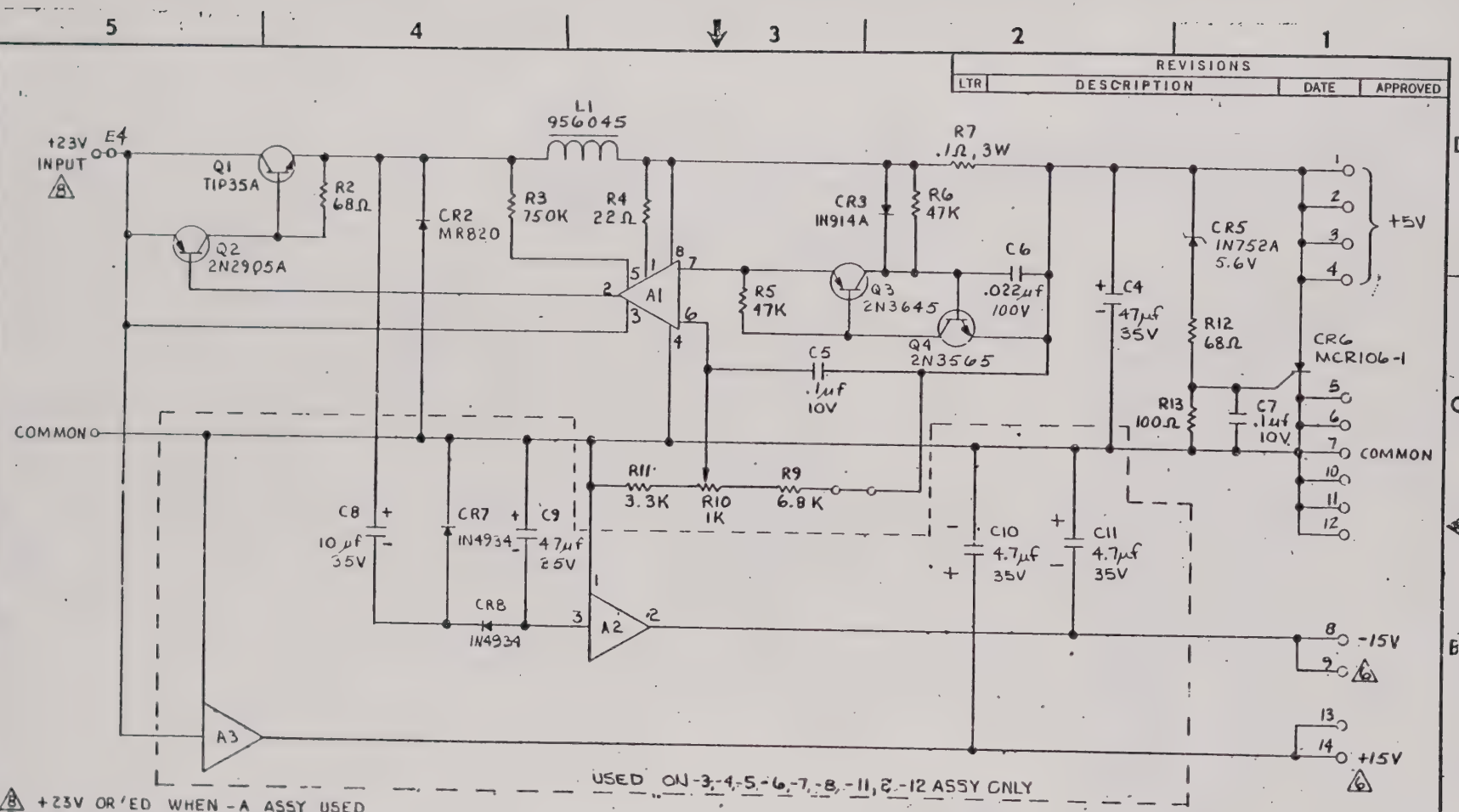
(49)

DWN	EK	3/23/73	
CHK		6/27/73	
SCALE	NONE	PSC 31160	

datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

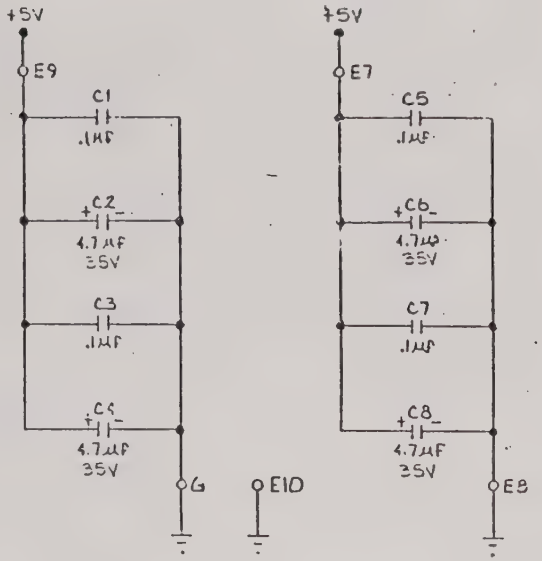
B | 16280 | H

SIZE | SHT 1 OF 2


REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
+23V INPUT
E4
Q1 TIP35A
Q2 2N2905A
R2 68Ω
L1 956045
CR2 MR820
R3 750K
R4 22Ω
A1
R7 .1Ω, 3W
CR3 IN914A
R6 47K
C6 .022μf 100V
Q3 2N3645
Q4 2N3565
R5 47K
C5 .1μf 10V
C4 47μf 35V
CR5 IN752A 5.6V
R12 68Ω
CR6 MCR106-1
R13 100Ω
C7 .1μf 10V
+5V
COMMON
R11 3.3K
R10 1K
R9 6.8K
C8 10μf 35V
CR7 IN4934
C9 47μf 25V
CR8 IN4934
A2
C10 4.7μf 35V
C11 4.7μf 35V
-15V
A3
+15V
USED ON -3, -4, -5, -6, -7, -8, -11, & -12 ASSY ONLY
8 +23V OR 'ED WHEN -A ASSY USED
7. -10 ASSY A3 IS 7808, A2 IS 79M08
6. -5 & -8 ASSY OUTPUT IS +12V -10 ASSY OUTPUT IS ± 8V
5. -5 ASSY A3 IS UGA7812393 OR MC7812CP
4. A3 IS UGA7815393 OR MC7815CP
3. A2 IS MC7915CP OR 7915UC
2. A1 IS LM305
1. RESISTORS ARE 1/4 W, 5%
NOTES: UNLESS OTHERWISE SPECIFIED
12. -H ASSY: CR51 IS VH148; ADD HEAT SINK.
11. -13 ASSY: A2 IS LM7909CT; A3 IS LM7910CT
10. -12 ASSY: A2 IS 7915UC
9. -11 ASSY: A2 IS MC7912CP, A3 IS MC7812CP
TITLE
REGULATOR
datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806
DWN EK 3/24/73
CHK 3/26/73
ENGR MAP 6/73
SCALE NONE
FSC 31160
B
16280
H
SIZE
SHT 2 OF 2

D	REVISED PER ECO T3947	11-26-79	D.R.
E	REVISED PER ECO T4168	8-13-80	A.R.
F	REVISED PER ECO T4806	11-15-83	E.H.
H	REVISED PER ECO T4841	3-12-84	D.F.
J	REVISED PER ECO T5341	6-18-86	I.C.
K	REVISED PER ECO T5549	10-12-87	B.H.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	ADDED C65,66,67 PER C.O. 4078	4-17-78	I.C.
B	UPDATED PER C.O. T3876	11-17-78	L.S.
C	UPDATED PER CO T3756	5-24-79	D.R./I.C.



74HC02	U1
74HC11	U4
74HC4538	U12
74HC74	U22
74LS154	U18
74LS197	U19
74LS73	U6
14538	U10
74123	U5
74150	U13,14,16,17
74LS196	U23-25
86S64	U8
LM311N	A4
96LS02	U3
74LS00	U7
74LS04	U15
74LS08	U26
74LS123	U11
74LS161	U28
74LS191	U30
74LS42	U20
74LS74	U2,9,27,29
MM74HC4066N	A1
DEVICE TYPE	REF. DES.

⚠ -3 ASSY. CHANGES U8 TO A 5X7 FONT P/N 86S64CAB
⚠ SEE SHEET 7 FOR -1 AND -2 ASSY. CIRCUITS

NOTES: UNLESS OTHERWISE SPECIFIED

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL .XX ± .03 .XXX ± .010 ANGLES ± 1/2°

TITLE: VIDEO TIME INSERTER

DWN STEVE 3/22/79 DES

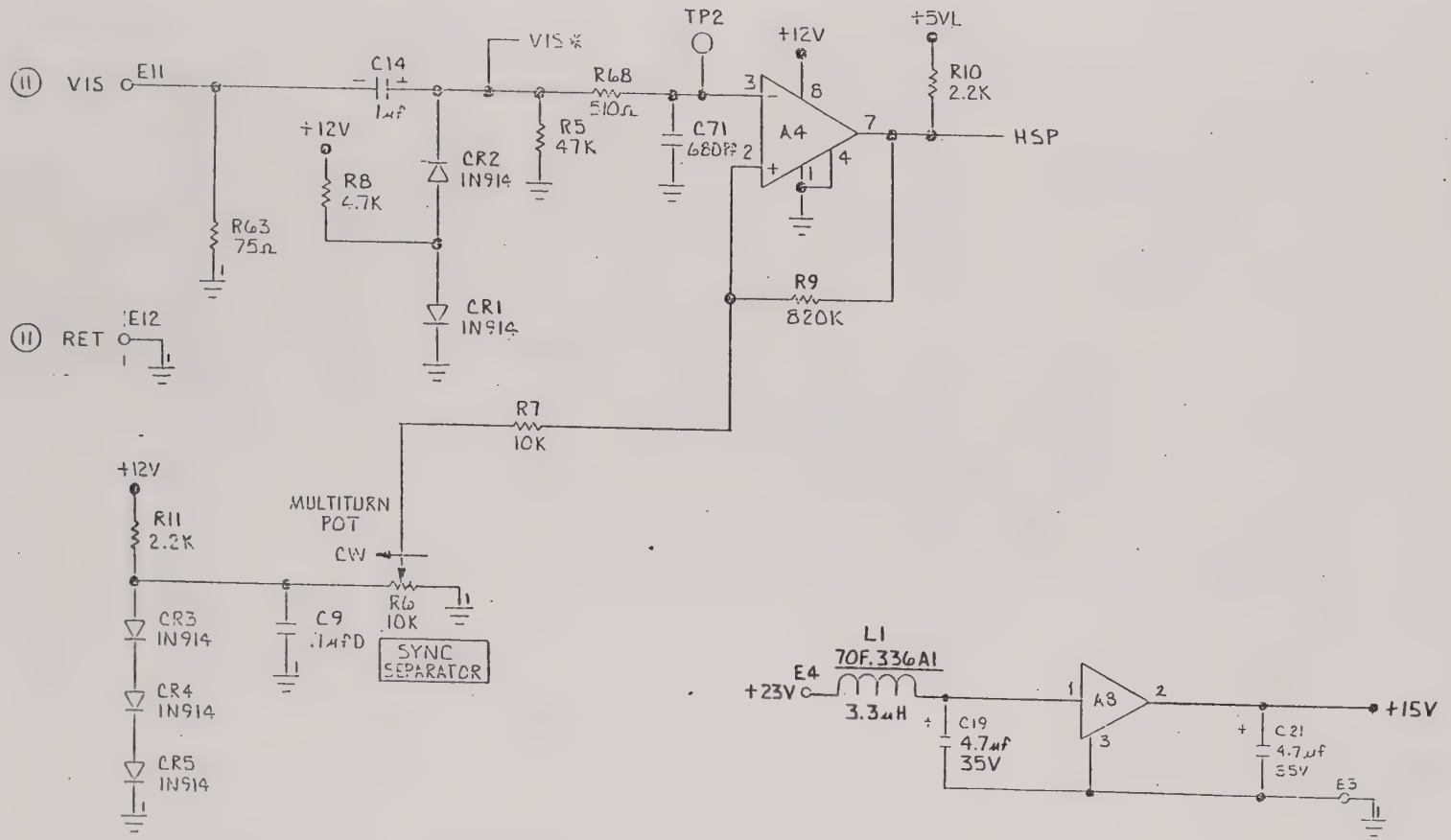
CHK ENGR 9/9/79

SCALE NONE FSC 31160

Datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

B 17269 K

SIZE SHT 1 OF 8 REV



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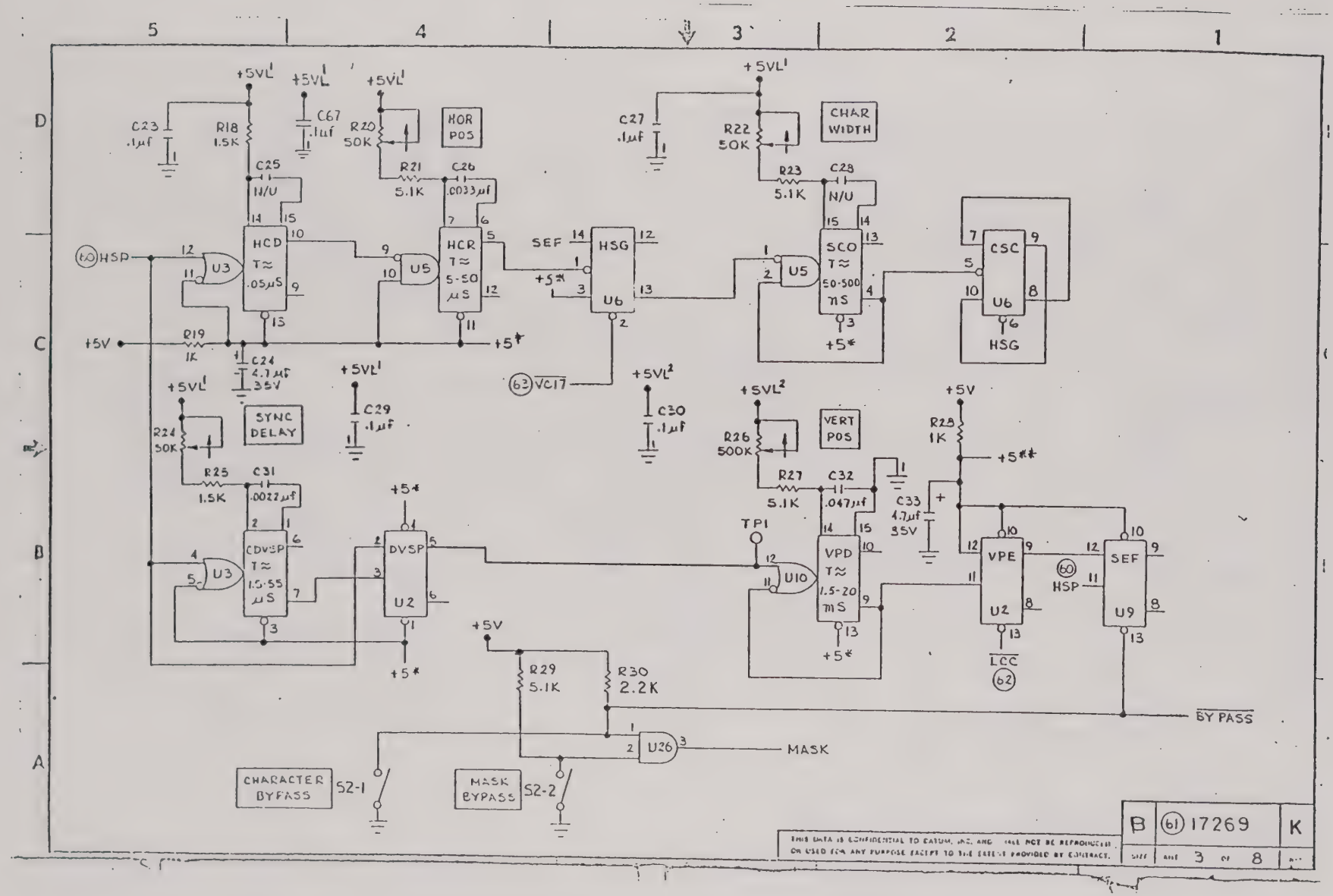
B | 17269 | K

2 of 8

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A 0268



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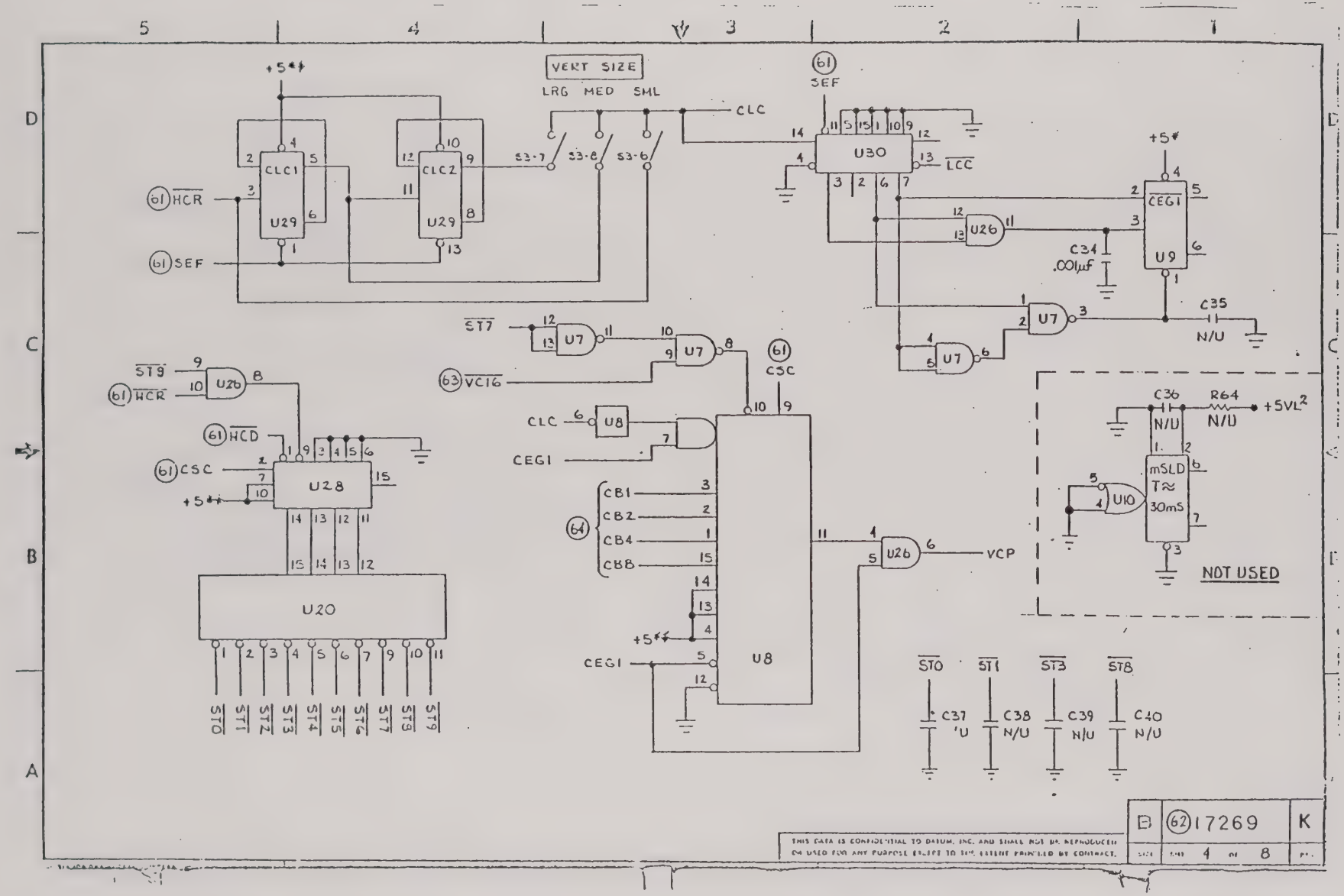

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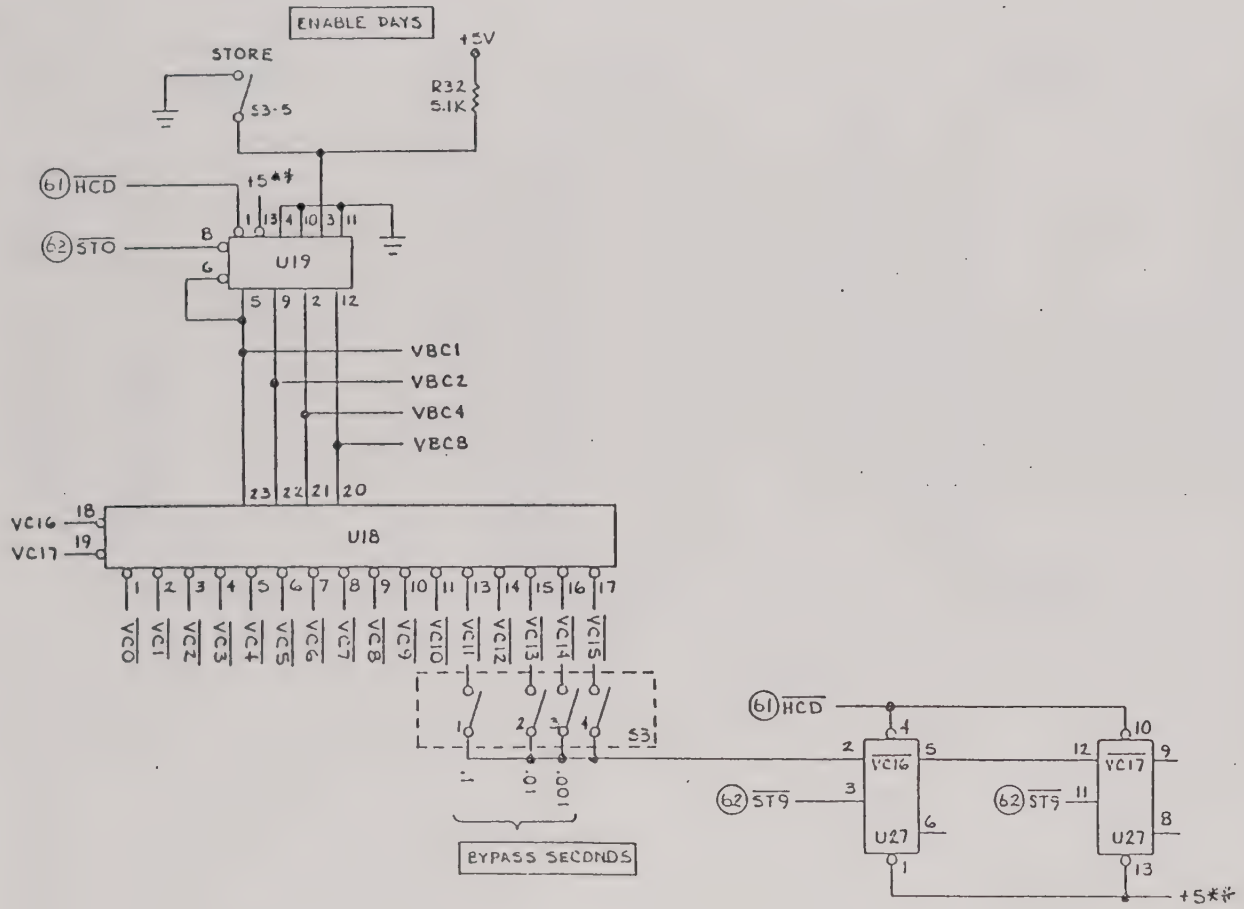
B	62 17269	K
SIZE	SHT 4 OF 8	REV



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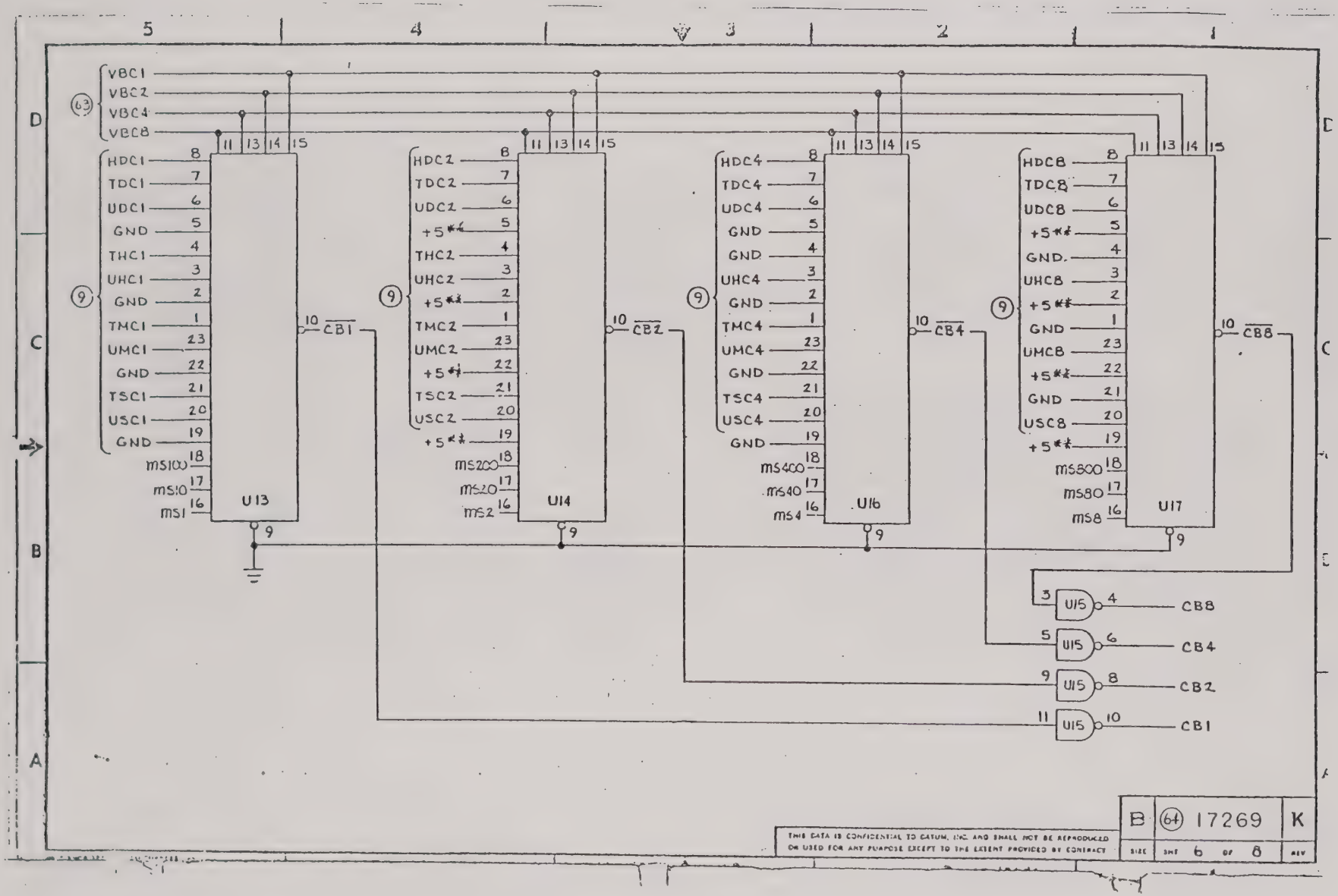
B	63 17269	K
SIZE	SHT 5 OF 8	REV



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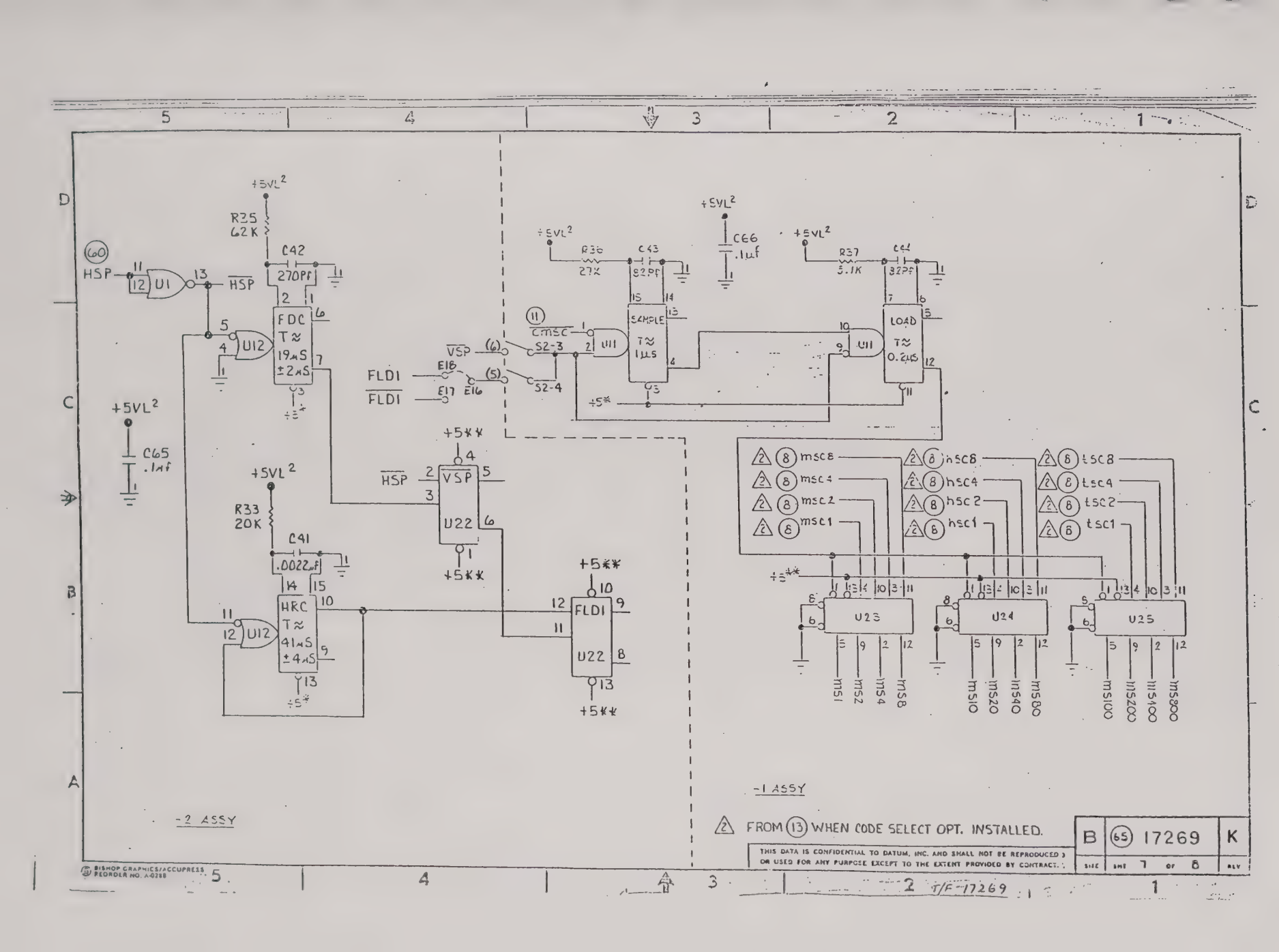
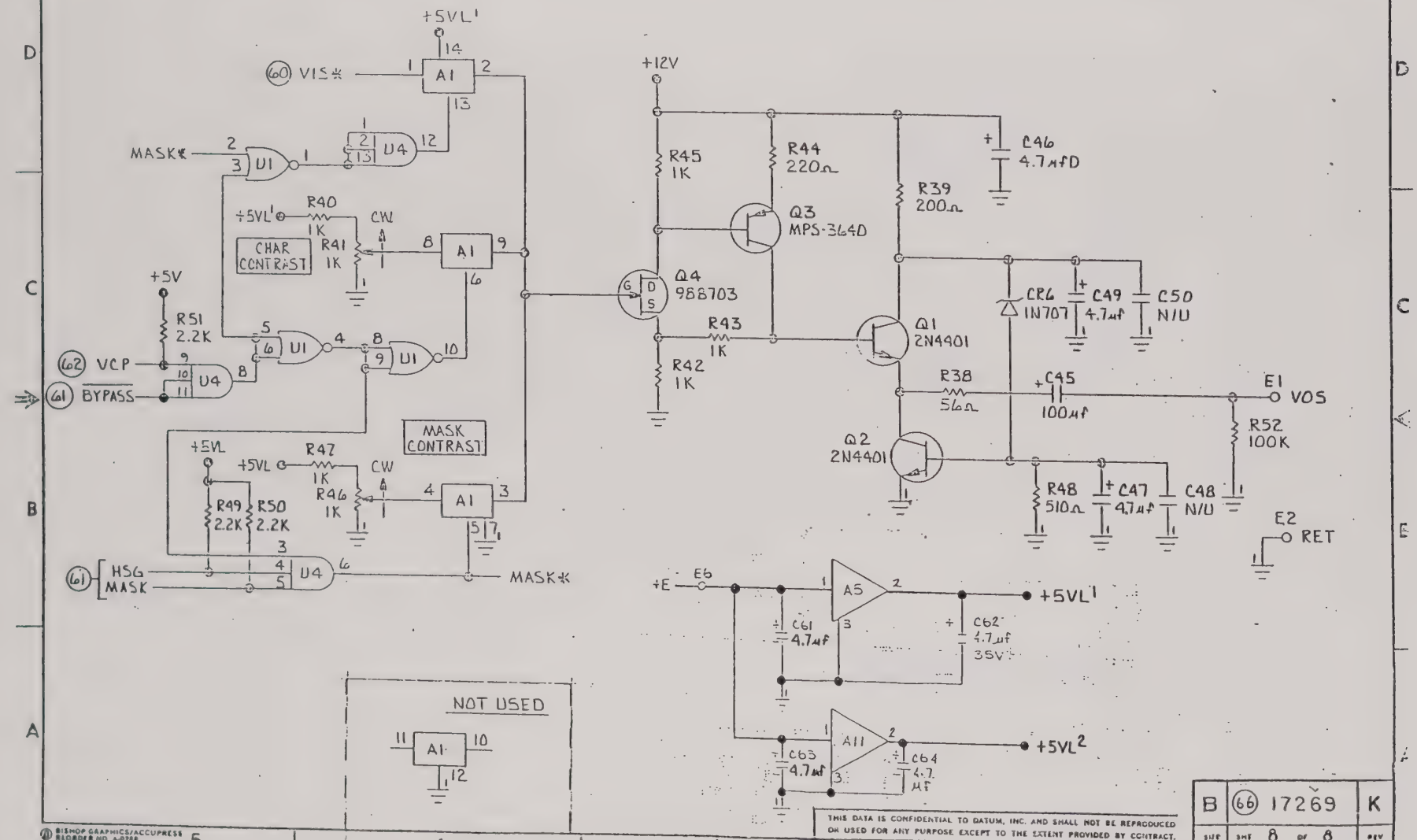
SIZE			REV
B	(64) 17269		K
	SHT 6 OF 8		


+5VL2
R35 62K
C42 270PF
(60) HSP
U1
HSP
FDC T≈ 19mS ±2mS
U12
C65 .1mf
R33 20K
C41 .0022mf
HRC T≈ 41mS ±4mS
U12
÷5*
+5VL2
R36 27K
C43 82PF
C66 .1uf
+5VL2
R37 5.1K
C44 82PF
(11) CMSC
VSP
(6) S2-3
E18
(5) S2-4
E17 E16
FLD1
FLD1
U11
SAMPLE T≈ 1μS
U11
LOAD T≈ 0.2μS
+5*
+5**
HSP
VSP
U22
+5**
+5**
FLD1
U22
+5**
(2) (8) msc8
(2) (8) msc4
(2) (8) msc2
(2) (8) msc1
(2) (8) hsc8
(2) (8) hsc4
(2) (8) hsc2
(2) (8) hsc1
(2) (8) tsc8
(2) (8) tsc4
(2) (8) tsc2
(2) (8) tsc1
+5**
U23
U24
U25
ms1
ms2
ms4
ms8
ms10
ms20
ms40
ms80
ms100
ms200
ms400
ms800
-2 ASSY
-1 ASSY
(2) FROM (13) WHEN CODE SELECT OPT. INSTALLED.
THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT.
B
(65) 17269
K
SHT 7 OF 8
T/F-17269
BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-0288


+5VL1
(60) VIS*
A1
MASK*
U1
U4
R40
1K
CW
+5VL1
CHAR CONTRAST
R41
1K
+5V
R51
2.2K
(62) VCP
(61) BYPASS
MASK CONTRAST
+5VL
R47
1K
R46
1K
R49
2.2K
R50
2.2K
(61) HSG MASK
MASK*
NOT USED
+12V
R45
1K
R44
220Ω
Q3
MPS-364D
R39
200Ω
C46
4.7μfD
Q4
988703
R43
1K
R42
1K
Q1
2N4401
CR6
IN707
C49
4.7μf
C50
N/U
R38
56Ω
C45
100μf
E1
VOS
R52
100K
Q2
2N4401
R48
510Ω
C47
4.7μf
C48
N/U
E2
RET
+E
E6
A5
+5VL1
C61
4.7μf
C62
4.7μf
35V
A11
+5VL2
C63
4.7μf
C64
4.7μf
THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT.
B
(66) 17269
K
SIZE
SHT 8 OF 8
REV

SECTION VIII
LIST OF MATERIALS

1.	Time Code Generator/Translator	9300-7053
2.	Time Code Generator/Translator	9300-001
3.	AGC	16085
4.	IRIG Basic	16543-136
5.	LED Display	16549-1
6.	Parallel Outputs	16635-123
7.	IRIG B Encoder	16062-1
8.	Power Supply	16280-3
9.	Video Time Inserter	17269-12

9300-7053 DATUM INC. JOB NO:_____
TIME CODE GEN/TRAN PARTS LIST
REV: A ENGR: RF QUANTITY:_____ PAGE: 1
DATE: 10/07/87

	PART NUMBER	DESCRIPTION REF. DES.		QTY PER	UM	STK/MFR
1	C16543-136	IRIG BASIC (CONVERSION)		1.00	EA	DATUM
2	SK9100-3	SHIPPING KIT		1.00	EA	DATUM
3	0125-56R2	RES:56.2 OHM,1W1%	STK	1.00	EA	DATUM
4	0226-0103	CAP:.01MF,1KV,20%	STK	2.00	EA	DATUM
5	16635-123	PARALLEL OUTPUT	STK	1.00	EA	DATUM
6	1704-1002	CONN:BNC 1F	STK	2.00	EA	DATUM
7	17269-12	VIDEO TIME INSERT	STK	2.00	EA	DATUM
8	1795-0001	FLAT WASHER	STK	2.00	EA	DATUM
9	1795-0002	SHOULDER WASHER	STK	2.00	EA	DATUM
10	700546	STIFFENER	STK	3.00	EA	DATUM
11	705756	BUTCH PLATE	STK	1.00	EA	DATUM
12	9300-001	TCG/T BASIC ASSY	STK	1.00	EA	DATUM

NOTES:

ASSY C16543-136 MAKE FROM 16543-16 IN BASIC ASSY (9300-001)

SHEAR OFF J5 ON ASSEMBLY 16635-123 BEFORE INSTALLING IN UNIT

END OF PARTS LIST FOR 9300-7053

9300-001
TCG/T BASIC ASSY
REV: D ENGR: CP
DATE: 12/14/87

DATUM INC.
PARTS LIST

JOB NO:_____

QUANTITY:_____ PAGE: 1

	PART NUMBER	DESCRIPTION REF. DES.		QTY PER	UM	STK/MFR
1	0226-0104-1	CAP:.1MF,100V,10%	STK	1.00	EA	DATUM
2	1202-0102	SW:TOGGLE SPDT	STK	4.00	EA	DATUM
3	1204-3903	SW:P/B SPST N/O	STK	10.00	EA	DATUM
4	1206-5112-N	SW:ROTARY 1P 2-12P	STK	1.00	EA	DATUM
5	1212-7606-1	SW:T/W 2P,BCD,10P	STK	1.00	EA	DATUM
6	1299-76SG-1	SW:BAND HARDWARE	STK	1.00	EA	DATUM
7	16062-1	IRIG ENCODER	STK	1.00	EA	DATUM
8	16085	AGC	STK	1.00	EA	DATUM
9	16280-3	POWER SUPPLY	STK	1.00	EA	DATUM
10	16543-1E	IRIG BASIC	STK	1.00	EA	DATUM
11	16549-1	DISPLAY	STK	1.00	EA	DATUM
12	1704-1002	CONN:BNC 1F	STK	2.00	EA	DATUM
13	1704-1625-6R	CONN: 6 PINS	STK	1.00	EA	DATUM
14	1709794	PC BOARD	STK	1.00	EA	DATUM
15	1792-1355	CONTACT SOCKET	STK	6.00	EA	DATUM
16	1795-0001	FLAT WASHER	STK	2.00	EA	DATUM
17	1795-0002	SHOULDER WASHER	STK	2.00	EA	DATUM
18	2325-2005	FASTENER	STK	2.00	EA	DATUM
19	2524-5010	BLACK KNOB	STK	1.00	EA	DATUM
20	700362	CENTER SUPPORT	STK	1.00	EA	DATUM
21	700364-2	COVER	STK	2.00	EA	DATUM
22	700546	STIFFENER	STK	3.00	EA	DATUM
23	703995	MOUNTING ANGLE	STK	2.00	EA	DATUM
24	704757-2	SIDE GUSSET	STK	2.00	EA	DATUM
25	704899-1	REAR PANEL	STK	1.00	EA	DATUM
26	705850	FRONT PANEL	STK	1.00	EA	DATUM
27	705853	COVER PLATE	STK	1.00	EA	DATUM

9300-001
TCG/T BASIC ASSY
REV: D ENGR: CP
DATE: 12/14/97

CATUM INC.
PARTS LIST

JOB NO:_____
QUANTITY:_____ PAGE: 2

PART NUMBER	DESCRIPTION REF. DES.		QTY PER	UM	STK/MFR
2E 705866-3	LENS #2423 RED	STK	1.00	EA	CATUM
2S 707349-1	BUTCH PLATE	STK	1.00	EA	CATUM
3C 931500	HANDLE 1 3/4"	STK	2.00	EA	CATUM

END OF PARTS LIST FOR 9300-001

16085 DATUM INC. JOB NO:_____

AGC PARTS LIST

REV: H ENGR: RE QUANTITY:_____ PAGE: 1

DATE: 10/22/87

	PART NUMBER	DESCRIPTION REF. DES.		QTY PER	UM	STK/MFR
1	0102-0102	RES:1K,1/4W,5% R21 R22 R26 R33 R38 R43 R45	STK	7.00	EA	DATUM
2	0102-0103	RES:10K,1/4W,5% R11 R28 R36 R41 R5 R6 R7	STK	7.00	EA	DATUM
3	0102-0105	RES:1M,1/4W,5% R1 R27 R42	STK	3.00	EA	DATUM
4	0102-0122	RES:1.2K,1/4W,5% R37	STK	1.00	EA	DATUM
5	0102-0124	RES:120K,1/4W,5% R15 R2 R35 R9	STK	4.00	EA	DATUM
6	0102-0152	RES:1.5K,1/4W,5% R30	STK	1.00	EA	DATUM
7	0102-0183	RES:18K,1/4W,5% R24	STK	1.00	EA	DATUM
8	0102-0202	RES:2K,1/4W,5% R46	STK	1.00	EA	DATUM
9	0102-0272	RES:2.7K 1/4W 5% R25 R32 R39	STK	3.00	EA	DATUM
10	0102-0274	RES:270K,1/4W,5% R47	STK	1.00	EA	DATUM
11	0102-0302	RES:3K,1/4W,5% R31	STK	1.00	EA	DATUM
12	0102-0330	RES:33 OHM,1/4W,5% R10	STK	1.00	EA	DATUM
13	0102-0391	RES:390 OHM1/4W 5% R44	STK	1.00	EA	DATUM
14	0102-0473	RES:47K,1/4W,5% R23	STK	1.00	EA	DATUM
15	0102-0511	RES:510 OHM 1/4W5% R18	STK	1.00	EA	DATUM
16	0102-0512	RES:5.1K,1/4W,5% R12 R13 R14 R20 R34 R4 R40 R8	STK	8.00	EA	DATUM
17	0102-0561	RES:560 OHM1/4W 5% R17	STK	1.00	EA	DATUM

	PART NUMBER	DESCRIPTION REF. DES.		QTY PER	UM	STK/MFR
18	0102-0682	RES:6.8K,1/4W,5% R29	STK	1.00	EA	DATUM
19	0102-0752	RES:7.5K,1/4W,5% R16	STK	1.00	EA	DATUM
20	0102-0753	RES:75K,1/4W,5% R19	STK	1.00	EA	DATUM
21	0102-0910	RES:91 OHM,1/4W,5% R3	STK	1.00	EA	DATUM
22	0104-0221	RES:220 OHM,1/2W5% R48	STK	1.00	EA	DATUM
23	0220-0105	CAP:1MF,35V,10% C15 C16 C19 C2 C20 C21	STK	6.00	EA	DATUM
24	0220-0107	CAP:100MF,10V,10% C14	STK	1.00	EA	DATUM
25	0220-0474	CAP:.47MF,35V,10% C4 C8	STK	2.00	EA	DATUM
26	0220-0475	CAP:4.7MF,35V,10% C12 C13 C17 C18 C3	STK	5.00	EA	DATUM
27	0221-0221	CAP:220MF,4V,10% C11A C11B	STK	2.00	EA	DATUM
28	0225-0152	CAP:1500PF,100V10% C10	STK	1.00	EA	DATUM
29	0225-0471	CAP:470PF,100V,10% C22	STK	1.00	EA	DATUM
30	0226-0100	CAP:10PF 500V 5% C6	STK	1.00	EA	DATUM
31	0226-0103-1	CAP:.01MF 100V 10% C7	STK	1.00	EA	DATUM
32	0226-0104-1	CAP:.1MF,100V,10% C1	STK	1.00	EA	DATUM
33	0226-0203	CAP:.02MF 100V 20% C5	STK	1.00	EA	DATUM
34	0226-0470	CAP:47PF 500V 5% C9	STK	1.00	EA	DATUM
35	0301-7405	IC 7405 A5	STK	1.00	EA	DATUM

	PART NUMBER	DESCRIPTION REF. DES.		QTY PER	UM	STK/MFR
36	0301-7749	IC 749 A1 A4	STK	2.00	EA	DATUM
37	0301-9311-H	IC 311H A2 A3	STK	2.00	EA	DATUM
38	0500-0306	DIODE:1N914 CR1 CR3	STK	2.00	EA	DATUM
39	0515-0705-1	DIODE:1N705A CR2	STK	1.00	EA	DATUM
40	0515-0752-1	DIODE:1N752A CR4	STK	1.00	EA	DATUM
41	0550-7705	TRANS:2N3565 Q6	STK	1.00	EA	DATUM
42	0555-6600	TRANS:2N3645 Q7	STK	1.00	EA	DATUM
43	0570-1087	TRANS:P1087 Q3 Q4 Q5	STK	3.00	EA	DATUM
44	0570-8703	TRANS:988703 Q2	STK	1.00	EA	DATUM
45	0570-8704	TRANS:988704 Q1	STK	1.00	EA	DATUM
46	170574E2	P.C. BOARD	STK	1.00	EA	DATUM
47	170785N/C	P.C. BOARD	STK	1.00	EA	DATUM
48	1708-3100-1	SOCKET:14 PINS XA1 XA4 XA5	STK	3.00	EA	DATUM
49	1708-8000	SOCKET:TO-5 CASE XA2 XA3	STK	2.00	EA	DATUM

END OF PARTS LIST FOR 16085

C16543-136
IRIG BASIC (CONVERSION)
REV: E ENGR: RE
DATE: 10/07/87

DATUM INC.
PARTS LIST

JOB NO:_____

QUANTITY:_____ PAGE: 1

	PART NUMBER	DESCRIPTION REF. DES.		QTY PER	UM	STK/MFR
1	1301-0001	OSCILLATOR: 1 MHZ Y1	STK	1.00	EA	DATUM

NOTES:

OSCILLATOR P/N 1301-0001 TO BE ASSEMBLED ON CARD ASSY 16543-16 IN BASIC UNIT

CONVERSION FROM 16543-16 TO 16543-136

END OF PARTS LIST FOR C16543-136

16543-16 DATUM INC. JOB NO:_____
IRIG BASIC PARTS LIST
REV: E ENGR: RE QUANTITY:_____ PAGE: 1
DATE: 09/22/87

	PART NUMBER	DESCRIPTION REF. DES.		QTY PER	UM	STK/MFR
1	0102-0102	RES:1K,1/4W,5% R4	STK	1.00	EA	DATUM
2	0102-0103	RES:10K,1/4W,5% R2	STK	1.00	EA	DATUM
3	0102-0151	RES:150 OHM1/4W 5% R3	STK	1.00	EA	DATUM
4	0102-0512	RES:5.1K,1/4W,5% R1	STK	1.00	EA	DATUM
5	0102-0562	RES:5.6K,1/4W,5% R10 R11 R9	STK	3.00	EA	DATUM
6	0126-R5K0	RES:CHIP,6K C6 C8	STK	2.00	EA	DATUM
7	0220-0475	CAP:4.7MF,35V,10% C14 C15 C16 C17 C22 C23 C3	STK	7.00	EA	DATUM
8	0221-0685	CAP:6.8MF,35V,10% C26	STK	1.00	EA	DATUM
9	0225-0221	CAP:220PF,100V,10% C1 C2	STK	2.00	EA	DATUM
10	0225-0330	CAP:33PF,100V,10% C10 C11 C12	STK	3.00	EA	DATUM
11	0225-0331	CAP:330PF,100V,10% C13 C9	STK	2.00	EA	DATUM
12	0226-0104	CAP:.1MF 25V 20% C18 C19 C20 C21 C24	STK	5.00	EA	DATUM
13	0301-7403	IC 74H103 F10	STK	1.00	EA	DATUM
14	0301-7406	IC 74H106 D4	STK	1.00	EA	DATUM
15	0301-7122	IC 74122 C11	STK	1.00	EA	DATUM
16	0301-7123	IC 74123 B11 D5	STK	2.00	EA	DATUM
17	0301-7156	IC 74156 C5 C7	STK	2.00	EA	DATUM
18	0301-7157	IC 74157 C4 D7 E7	STK	3.00	EA	DATUM

	PART NUMBER	DESCRIPTION REF. DES.						QTY PER	UM	STK/MFR
19	0301-7176	IC 74176 E5	F4	F5	F6	F7	STK	5.00	EA	DATUM
20	0301-7177	IC 74177 C10	E11				STK	2.00	EA	DATUM
21	0301-7192	IC 74192 B10	B2	B3	B4	B5	STK B6 B7 B8 B9 E4	10.00	EA	DATUM
22	0301-7194	IC 74194 C2					STK	1.00	EA	DATUM
23	0301-7400	IC 7400 A11	D10	D2			STK	3.00	EA	DATUM
24	0301-7404	IC 7404 D3					STK	1.00	EA	DATUM
25	0301-7408	IC 7408 D9	F8	F9			STK	3.00	EA	DATUM
26	0301-7410	IC 7410 D11					STK	1.00	EA	DATUM
27	0301-7411	IC 7411 C9					STK	1.00	EA	DATUM
28	0301-7425	IC 7425 E8					STK	1.00	EA	DATUM
29	0301-7432	IC 7432 D6					STK	1.00	EA	DATUM
30	0301-7442	IC 7442 E6					STK	1.00	EA	DATUM
31	0301-7473	IC 7473 E10					STK	1.00	EA	DATUM
32	0301-7474	IC 7474 E9	F11				STK	2.00	EA	DATUM
33	0301-7486	IC 7486 C3	D8				STK	2.00	EA	DATUM
34	0301-9374	IC 9374 A10	A2	A3	A4	A5	STK A6 A7 A8 A9	9.00	EA	DATUM

	PART NUMBER	DESCRIPTION REF. DES.	QTY PER	UM	STK/MFR
35	1708-3397	SOCKET:14 PINS STK XA11 XC10 XC11 XC3 XC6 XC8 XC9 XD10 XD11 XD2 XD3 XD6 XD8 XD9 XE10 XE11 XE5 XE8 XE9 XF10 XF11 XF4 XF5 XF6 XF7 XF8 XF9	27.00	EA	DATUM
36	1708-3398	SOCKET:16 PINS STK XA10 XA2 XA3 XA4 XA5 XA6 XA7 XA8 XA9 XB10 XB11 XB2 XB3 XB4 XB5 XB6 XB7 XB8 XB9 XC2 XC4 XC5 XC7 XD4 XD5 XD7 XE4 XE6 XE7	29.00	EA	DATUM
37	170969E1	PC BOARD STK	1.00	EA	DATUM
38	2310-1791-8	FASTENER:1/4"X4-40 STK	2.00	EA	DATUM

END OF PARTS LIST FOR 16543-16

C16543-135
IRIG BASIC (CONVERSION)
REV: E ENGR: RE
DATE: 10/07/87

DATUM INC.
PARTS LIST

JOB NO:_____

QUANTITY:_____ PAGE: 1

	PART NUMBER	DESCRIPTION REF. DES.		QTY PER	UM	STK/MFR
1	1301-0001	OSCILLATOR: 1 MHZ Y1	STK	1.00	EA	DATUM

NOTES:

OSCILLATOR P/N 1301-C001 TC BE ASSEMBLED ON CARD ASSY 16543-16 IN BASIC UNIT

CONVERSION FROM 16543-16 TO 16543-136

END OF PARTS LIST FOR C16543-136

16549-1 DATUM INC. JOB NO:_____
DISPLAY PARTS LIST
REV: ENGR: RF QUANTITY:_____ PAGE: 1
DATE: 10/22/87

	PART NUMBER	DESCRIPTION REF. DES.		QTY PER	UM	STK/MFR
1	1708-0036	CONN: 36 PINS	STK	2.00	EA	DATUM
2	1708-3798-1	SOCKET:14 PINS	STK	9.00	EA	DATUM
3	1709378	P.C. BOARD	STK	1.00	EA	DATUM
4	2205-0006	DISPLAY:7-SEGMENTS DS1 DS2 DS3 DS4 DS5 DS6 DS7 DS8 DS9	STK	9.00	EA	DATUM

NOTES:

1. REF.: A-16549 ASSEMBLY AID

END OF PARTS LIST FOR 16549-1

16635-123 DATUM INC. JOB NO:_____
PARALLEL OUTPUT PARTS LIST
REV: A ENGR: RE QUANTITY:_____ PAGE:
DATE: 10/22/87

	PART NUMBER	DESCRIPTION REF. DES.		QTY PER	UM	STK/MFR
1	0102-0103	RES:10K,1/4W,5% R2	STK	1.00	EA	DATUM
2	0102-0222	RES:2.2K,1/4W,5% R1	STK	1.00	EA	DATUM
3	0220-0475	CAP:4.7MF,35V,10% C1 C3	STK	2.00	EA	DATUM
4	0225-0471	CAP:470PF,100V,10% C5	STK	1.00	EA	DATUM
5	0226-0103-1	CAP:.01MF 100V 10% C6	STK	1.00	EA	DATUM
6	0226-0104	CAP:.1MF 25V 20% C2 C4	STK	2.00	EA	DATUM
7	0301-7123	IC 74123 A1	STK	1.00	EA	DATUM
8	0301-7408	IC 7408 A14 A15 A16 A17 A18 A19 A2 A3 A4 A5 A6 A7	STK	12.00	EA	DATUM
9	1704-0050	CONN: 50 PINS J4	STK	1.00	EA	DATUM
10	1708-3897	SOCKET:14 PINS XA14 XA15 XA16 XA17 XA18 XA19 XA2 XA3 XA4 XA5 XA6 XA7	STK	12.00	EA	DATUM
11	1708-3898	SOCKET:16 PINS XA1	STK	1.00	EA	DATUM
12	171112N/C	P.C. BOARD	STK	1.00	EA	DATUM
13	703336	CONN MTG PLATE	STK	1.00	EA	DATUM

END OF PARTS LIST FOR 16635-123

16052-1
IRIG ENCODER
REV: C ENGR: RE
DATE: 10/22/87

DATUM INC.
PARTS LIST

JOB NO:_____
QUANTITY:_____ PAGE: 1

	PART NUMBER	DESCRIPTION REF. DES.		QTY PER	UM	STK/MFR
1	0102-0100	RES:10 OHM,1/4W,5% R26 R27	STK	2.00	EA	DATUM
2	0102-0103	RES:10K,1/4W,5% R11 R16 R18 R19 R2	STK	5.00	EA	DATUM
3	0102-0104	RES:100K,1/4W,5% R20	STK	1.00	EA	DATUM
4	0102-0222	RES:2.2K,1/4W,5% R1 R13	STK	2.00	EA	DATUM
5	0102-0332	RES:3.3K,1/4W,5% R3	STK	1.00	EA	DATUM
6	0102-0472	RES:4.7K,1/4W,5% R12	STK	1.00	EA	DATUM
7	0102-0473	RES:47K,1/4W,5% R10 R14 R6	STK	3.00	EA	DATUM
8	0102-0510	RES:51 OHM,1/4W,5% R25	STK	1.00	EA	DATUM
9	0115-2262	RES:22.6K,1/4W,1% R4 R5 R9	STK	3.00	EA	DATUM
10	0115-5111	RES:5.11K,1/4W,1% R8	STK	1.00	EA	DATUM
11	0154-2002	RES:POT 20K 1T1/2W R7	STK	1.00	EA	DATUM
12	0154-5001	RES:POT 5K 1T 1/2W R15 R17	STK	2.00	EA	DATUM
13	0201-0221	CAP:220PF 500V 5% C10	STK	1.00	EA	DATUM
14	0212-0222	CAP:.0022MF,100V5% C6 C8	STK	2.00	EA	DATUM
15	0212-0223	CAP:.022MF,100V,5% C7 C9	STK	2.00	EA	DATUM
16	0220-0475	CAP:4.7MF,35V,10% C1 C3 C5	STK	3.00	EA	DATUM
17	0226-0104	CAP:.1MF 25V 20% C2 C4	STK	2.00	EA	DATUM
18	0226-0104-1	CAP:.1MF,100V,10% C11 C12	STK	2.00	EA	DATUM

16062-1 DATUM INC. JOB NO:_____
IRIG ENCODER PARTS LIST
REV: C ENGR: RE QUANTITY:_____ PAGE: 2
DATE: 10/22/87

	PART NUMBER	DESCRIPTION REF. DES.		QTY PER	UM	STK/MFR
19	0301-5558	IC 1458 A17 A18	STK	2.00	EA	DATUM
20	0301-7151	IC 74151A A10 A11 A12 A13 A14 A15	STK	6.00	EA	DATUM
21	0301-7400	IC 7400 A2 A3	STK	2.00	EA	DATUM
22	0301-7408.	IC 7408 A1 A16 A4	STK	3.00	EA	DATUM
23	0301-7411	IC 7411 A5	STK	1.00	EA	DATUM
24	0301-7432	IC 7432 A6 A8	STK	2.00	EA	DATUM
25	0302-LS10-7	IC 74LS107 A7	STK	1.00	EA	DATUM
26	0570-1087	TRANS:P1087 Q1	STK	1.00	EA	DATUM
27	1705184	P.C. BOARD	STK	1.00	EA	DATUM
28	1706-2010	TERMINAL:1/16"PCB TP1 TP2 TP3 TP4	STK	4.00	EA	DATUM
29	1708-2034	SOCKET:8 PINS	STK	2.00	EA	DATUM
30	1708-3897	SOCKET:14 PINS	STK	9.00	EA	DATUM
31	1708-3898	SOCKET:16 PINS	STK	6.00	EA	DATUM

END OF PARTS LIST FOR 16062-1

16280-3
POWER SUPPLY
REV: H ENGR: BH
DATE: 12/15/87

DATUM INC.
PARTS LIST

JOB NO:_____
QUANTITY:_____ PAGE: 1

	PART NUMBER	DESCRIPTION REF. DES.		QTY PER	UM	STK/MFR
1	0102-0101	RES:100 OHM1/4W 5% R13	STK	1.00	EA	DATUM
2	0102-0220	RES:22 OHM,1/4W,5% R4	STK	1.00	EA	DATUM
3	0102-0332	RES:3.3K,1/4W,5% R11	STK	1.00	EA	DATUM
4	0102-0472	RES:4.7K,1/4W,5% R1	STK	1.00	EA	DATUM
5	0102-0473	RES:47K,1/4W,5% R5 R6	STK	2.00	EA	DATUM
6	0102-0680	RES:68 OHM,1/4W,5% R12 R2	STK	2.00	EA	DATUM
7	0102-0682	RES:6.8K,1/4W,5% R9	STK	1.00	EA	DATUM
8	0102-0754	RES:750K,1/4W,5% R3	STK	1.00	EA	DATUM
9	0125-0R10	RES:.1 OHM,3W,3% R7	STK	1.00	EA	DATUM
10	0154-1001	RES:PCT 1K 1T 1/2W R10	STK	1.00	EA	DATUM
11	0212-0223	CAP:.022MF,100V,5% C6	STK	1.00	EA	DATUM
12	0219-0588	CAP:5800MF,40V C1	STK	1.00	EA	DATUM
13	0220-0106-1	CAP:10MF,35V,10% C8	STK	1.00	EA	DATUM
14	0220-0475	CAP:4.7MF,35V,10% C10 C11	STK	2.00	EA	DATUM
15	0220-0476	CAP:47MF,35V,10% C4 C9	STK	2.00	EA	DATUM
16	0226-0103	CAP:.01MF,1KV,20% C101 C102	STK	2.00	EA	DATUM
17	0226-0104	CAP:.1MF 25V 20% C5 C7	STK	2.00	EA	DATUM
18	0301-7815	IC 7815 A3	STK	1.00	EA	DATUM

16280-3
POWER SUPPLY
REV: H ENGR: BH
DATE: 12/15/87

CATUM INC.
PARTS LIST

JOB NO:_____
QUANTITY:_____ PAGE: 2

	PART NUMBER	DESCRIPTION REF. DES.		QTY PER	UM	STK/MFR
19	0301-7915	IC 7915 A2	STK	1.00	EA	CATUM
20	0301-9305	IC 305 A1	STK	1.00	EA	CATUM
21	0500-0306	DIODE:1N914 CR3	STK	1.00	EA	CATUM
22	0515-0752-1	DIODE:1N752A CR5	STK	1.00	EA	CATUM
23	0540-0106-1	DIODE:MCR106-1 CR6	STK	1.00	EA	CATUM
24	0540-0447	DIODE:VS447 CRS1	STK	1.00	EA	CATUM
25	0540-0820	DIODE:MR820 CR2	STK	1.00	EA	CATUM
26	0540-4720-1	DIODE:MR501 CR1	STK	1.00	EA	CATUM
27	0540-4934	DIODE:1N4934 CR7 CR8	STK	2.00	EA	CATUM
28	0550-035A	TRANS:TIP-35A Q1	STK	1.00	EA	CATUM
29	0550-7705	TRANS:2N3565 Q4	STK	1.00	EA	CATUM
30	0555-6005	TRANS:2N2905A Q2	STK	1.00	EA	CATUM
31	0555-6500	TRANS:2N3645 Q3	STK	1.00	EA	CATUM
32	0601-6045	CHOKE:200 UH L1	STK	1.00	EA	CATUM
33	0601-6082	TRANSFORMER:POWER T1	STK	1.00	EA	CATUM
34	0702-0010	FUSE:1A S/B 3AG F1	STK	1.00	EA	CATUM
35	0750-0200	FUSE HOLDER 3AG XF1	STK	1.00	EA	CATUM
36	1704-1061-1	CONN: 7A,125V	STK	1.00	EA	CATUM

	PART NUMBER	DESCRIPTION REF. DES.		QTY PER	UM	STK/MFR
37	1706-0033	EYELET:1/16"PCB XL1-A XL1-B	STK	2.00	EA	DATUM
38	170778E	PC BOARD	STK	1.00	EA	DATUM
39	170779C	PC BOARD	STK	1.00	EA	DATUM
40	1708-3897	SOCKET:14 PINS XA3	STK	1.00	EA	DATUM
41	1708-8000	SOCKET:TO-5 CASE XA1	STK	1.00	EA	DATUM
42	2310-1247-09	SPACER:#6X1/8 L1	STK	1.00	EA	DATUM
43	2325-1004	TOROID RETAINER L1	STK	1.00	EA	DATUM
44	704561	MOUNTING PLATE P/S	STK	1.00	EA	DATUM
45	704562	P/S SIDE SUPPORT	STK	1.00	EA	DATUM
46	704966-1	TRANSFORMER BRACKT	STK	1.00	EA	DATUM
47	704966-2	TRANSFORMER BRACKT	STK	2.00	EA	DATUM
48	707350	HEAT SINK	STK	1.00	EA	DATUM

NOTES:

1. USE MANUFACTURING STOCK P/N 120-4 TORCID RETAINER X1 REF (L1)
2. REF.: ASSEMBLY AID A-16280

END OF PARTS LIST FOR 16280-3

17269-12
VIDEO TIME INSERT
REV: K ENGR: LS
DATE: 01/28/83

DATUM INC.
PARTS LIST

JOB NO:_____
QUANTITY:_____ PAGE: 1

	PART NUMBER	DESCRIPTION REF. DES.		QTY PER	UM	STK/MFR
1	0102-0102	RES:1K,1/4W,5% R19 R29 R40 R42 R43 R45 R47	STK	7.00	EA	DATUM
2	0102-0103	RES:10K,1/4W,5% R7	STK	1.00	EA	DATUM
3	0102-0104	RES:100K,1/4W,5% R52	STK	1.00	EA	DATUM
4	0102-0152	RES:1.5K,1/4W,5% R18 R25	STK	2.00	EA	DATUM
5	0102-0201	RES:200 OHM1/4W 5% R39	STK	1.00	EA	DATUM
6	0102-0203	RES:20K,1/4W,5% R33	STK	1.00	EA	DATUM
7	0102-0221	RES:220 OHM1/4W 5% R44	STK	1.00	EA	DATUM
8	0102-0222	RES:2.2K,1/4W,5% R10 R11 R30 R49 R50 R51	STK	6.00	EA	DATUM
9	0102-0273	RES:27K,1/4W,5% R36	STK	1.00	EA	DATUM
10	0102-0472	RES:4.7K,1/4W,5% R8	STK	1.00	EA	DATUM
11	0102-0473	RES:47K,1/4W,5% R5	STK	1.00	EA	DATUM
12	0102-0511	RES:510 OHM 1/4W5% R48 R68	STK	2.00	EA	DATUM
13	0102-0512	RES:5.1K,1/4W,5% R21 R23 R27 R29 R32 R37	STK	6.00	EA	DATUM
14	0102-0560	RES:56 OHM,1/4W,5% R38	STK	1.00	EA	DATUM
15	0102-0623	RES:62K,1/4W,5% R35	STK	1.00	EA	DATUM
16	0102-0750	RES:75 OHM,1/4W,5% R63	STK	1.00	EA	DATUM
17	0102-0824	RES:820K,1/4W,5% R9	STK	1.00	EA	DATUM

	PART NUMBER	DESCRIPTION REF. DES.		QTY PER	UM	STK/MFR
18	0154-1001	RES:PCT 1M 1T 1/2W R41 R46	STK	2.00	EA	DATUM
19	0154-1002	RES:PCT 10K 1T1/2W R6	STK	1.00	EA	DATUM
20	0154-5002	RES:PCT 5CK 1T1/2W R20 R22 R24	STK	3.00	EA	DATUM
21	0154-5003	RES:PCT 5CCK1T1/2W R26	STK	1.00	EA	DATUM
22	0210-0122-1	CAP:.0022MF,100V5% C31	STK	1.00	EA	DATUM
23	0210-0332-1	CAP:.0033MF,100V5% C26	STK	1.00	EA	DATUM
24	0212-0102	CAP:.001MF,100V,5% C34	STK	1.00	EA	DATUM
25	0212-0222	CAP:.0022MF,100V5% C41	STK	1.00	EA	DATUM
26	0212-0473	CAP:.047MF,100V,5% C32	STK	1.00	EA	DATUM
27	0220-0105	CAP:1MF,35V,10% C14	STK	1.00	EA	DATUM
28	0220-0107	CAP:100MF,10V,10% C45	STK	1.00	EA	DATUM
29	0220-0475	CAP:4.7MF,35V,10% C19 C2 C21 C24 C33 C4 C46 C47 C49 C5 C61 C62 C63 C64 C5	STK	15.00	EA	DATUM
30	0225-0681	CAP:680PF,100V,10% C71	STK	1.00	EA	DATUM
31	0225-0820	CAP:82PF,100V,10% C43 C44	STK	2.00	EA	DATUM
32	0226-0104-2	CAP:.1MF50V-20+80% C1 C23 C27 C29 C3 C30 C5 C65 C66 C67 C7 C9	STK	12.00	EA	DATUM
33	0227-0271	CAP:270PF,300V,5% C42	STK	1.00	EA	DATUM
34	0301-HC02	IC 74HC02 U1	STK	1.00	EA	DATUM

17269-12
VIDEO TIME INSERT
REV: K ENGR: LS
DATE: 01/28/83

DATUM INC.
PARTS LIST

JOB NO:_____
QUANTITY:_____ PAGE: 3

	PART NUMBER	DESCRIPTION REF. DES.				QTY PER	UM	STK/MFR
35	0301-HC11	IC 74HC11 U4			STK	1.00	EA	DATUM
36	0301-HC40-66	IC 74HC4066 A1			STK	1.00	EA	DATUM
37	0301-HC45-38	IC 74HC4538 U12			STK	1.00	EA	DATUM
38	0301-HC74	IC 74HC74 U22			STK	1.00	EA	DATUM
39	0301-1453-3	IC 1453 U10			STK	1.00	EA	DATUM
40	0301-74LS1-54	IC 74LS154 U18			STK	1.00	EA	DATUM
41	0301-74LS1-97	IC 74LS197 U19			STK	1.00	EA	DATUM
42	0301-74LS7-3	IC 74LS73 U6			STK	1.00	EA	DATUM
43	0301-7123	IC 74123 U5			STK	1.00	EA	DATUM
44	0301-7150	IC 74150 U13	U14	U16	U17	STK	4.00	EA DATUM
45	0301-78C5	IC 78C5 A11	A5			STK	2.00	EA DATUM
46	0301-7915	IC 7915 A8				STK	1.00	EA DATUM
47	0301-8292	IC 74LS196 U23	U24	U25		STK	3.00	EA DATUM
48	0301-8678	IC 8678 U8				STK	1.00	EA DATUM
49	0301-9311-M	IC 311N A4				STK	1.00	EA DATUM
50	0301-96LS-02	IC 96LS02 U3				STK	1.00	EA DATUM
51	0302-LS00	IC 74LS00 U7				STK	1.00	EA DATUM
52	0302-LS04	IC 74LS04 U15				STK	1.00	EA DATUM

DATUM INC.
PARTS LIST

CODE NO:_____

QUANTITY:_____ PAGE: 4

	PART NUMBER	DESCRIPTION REF. DES.						QTY PER	UM	STK/MFR
53	0302-LS08	IC 74LS08 U26					STK	1.00	EA	DATUM
54	0302-LS123	IC 74LS123 U11					STK	1.00	EA	DATUM
55	0302-LS161	IC 74LS161 U28					STK	1.00	EA	DATUM
56	0302-LS191	IC 74LS191 U30					STK	1.00	EA	DATUM
57	0302-LS42	IC 74LS42 U20					STK	1.00	EA	DATUM
58	0302-LS74	IC 74LS74 U2	U27	L29	L9		STK	4.00	EA	DATUM
59	0500-0306	DIODE:1N914 CR1	CR2	CR3	CR4	CR5	STK	5.00	EA	DATUM
60	0515-1001	DIODE:1N7071 CR6					STK	1.00	EA	DATUM
61	0550-4401-18	TRANS:2N4401 Q1	Q2				STK	2.00	EA	DATUM
62	0555-3540	TRANS:MPS3640 Q3					STK	1.00	EA	DATUM
63	0570-8703	TRANS:9687C3 Q4					STK	1.00	EA	DATUM
64	0601-0332	CHOKE:3.3UH 10% L1					STK	1.00	EA	DATUM
65	1202-1006	SWITCH:DIP 8POS S3					STK	1.00	EA	DATUM
66	1202-7504	SWITCH:DIP 4 POS S2					STK	1.00	EA	DATUM
67	1708-2034	SOCKET:8 PINS XA4	XS2				STK	2.00	EA	DATUM
68	1708-3396	SOCKET:24 PINS XU13	XL14	XL16	XL17	XL18	STK	5.00	EA	DATUM
69	1708-3697	SOCKET:14 PINS XA1	XL1	XL15	XL19	XL2	STK XL22 XL29	16.00	EA	DATUM
		XU23	XL24	XL25	XL26	XL27				
		XU4	XL6	XL7	XL9					

17269-12
VIDEO TIME INSERT
REV: K ENGR: LS
DATE: 01/28/88

CATUM INC.
PARTS LIST

JOB NO:_____

QUANTITY:_____ PAGE: 5

PART NUMBER	DESCRIPTION REF. DES.						QTY PER	UM	STK/MFR
70 1708-3898	SOCKET:16 PINS					STK	10.00	EA	CATUM
	XS3	XL10	XL11	XL12	XU20	XL28			
	XU3	XL30	XL5	XL8					
71 172100N/C1	PC BOARD					STK	1.00	EA	CATUM
72 707422	HEAT SINK					STK	1.00	EA	CATUM

NOTES:

1. REF:A-17269 ASSY AID.
2. USE W/W STAKE (3 WRAP) FROM MANUFACTURING STOCK P/N 5128-5931-3 (X4) REF.DES.TP1,TP2,E13,E14.
3. FROM LOCATION GAUGE TO LOCATION REMARKS

A1-1	26	E14	VIS*
L22-5	26	E13	VSF\
U1-13	26	L12-5	

END OF PARTS LIST FOR 17269-12

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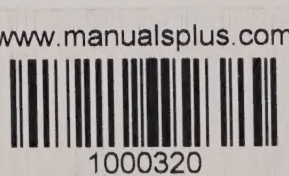

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